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ABSTRACT

Presented are the state guidelines and framework for the infusion of energy education into the Texas public school curriculum. Designed to assist teachers, administrators, and other school personnel in the process of infusing energy education concepts, this guide focuses on the basic concerns and needs of the people as related to energy and suggests ways in which energy conservation can become a part of all disciplines in elementary and secondary schools. Included is the Program Training Manual for Energy Conservation Grants which contains a synopsis of the Federal Grants Program and describes the strategy through which the state will assure compliance with the regulations. (BT)

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ENERGY MANAGEMENT FOR SCHOOL ADMINISTRATORS

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CURRICULUM INFUSION

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SOLUTIONS TO THE ENERGY EDUCATION PROBLEM:

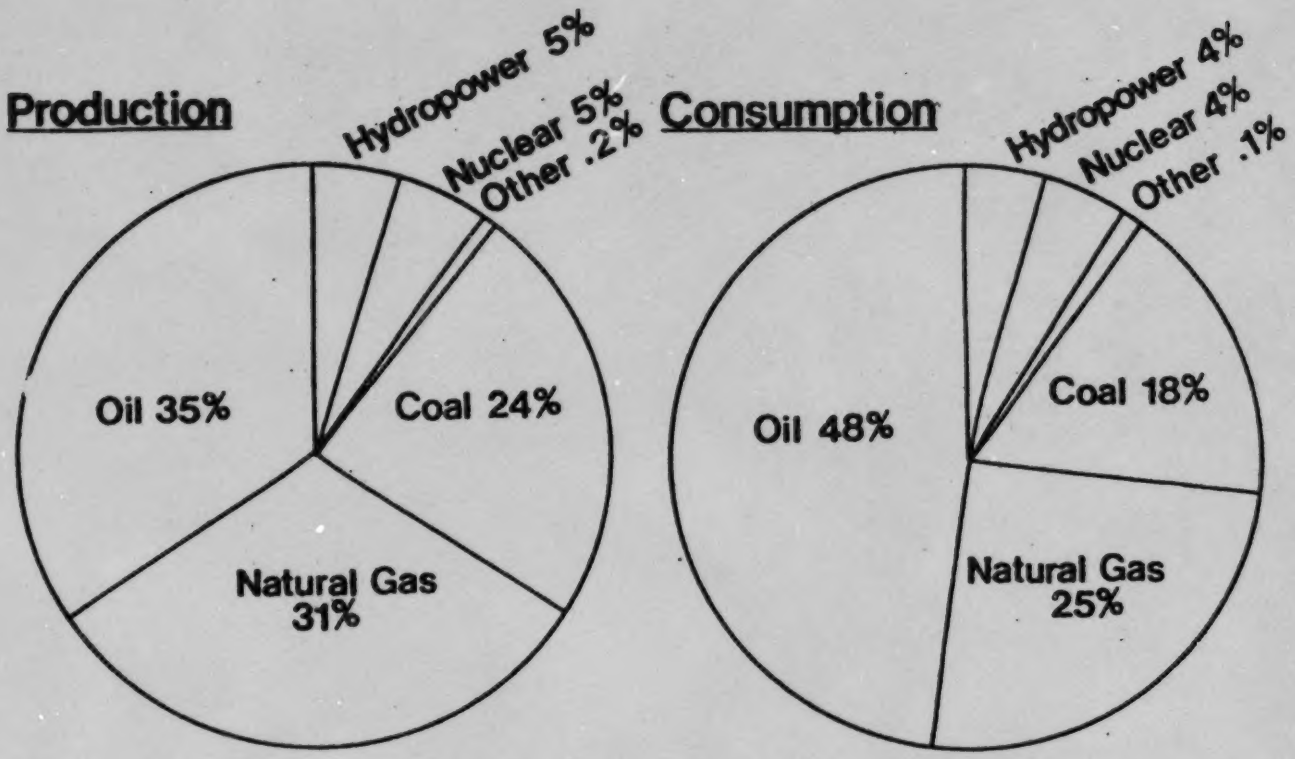
The National Energy Plan states the U.S. and the world are at the early stage of an energy transition. This transition springs from the need to adjust to scarcity & higher prices. (1) Unless the U.S. makes a timely adjustment before world oil becomes very scarce and very expensive in the 1980's the nation's economic security and the American way of life will be gravely endangered. (1)

Energy consuption and production data for 1978 are available and they indicate some changes in the U.S. energy consumption patterns. Overall domestic energy consumption increased from 76.6 QBtu in 1977 to 78.0 QBtu in 1978. This reflects an increase of 1.9% over 1977.

The distribution of this consumption has changed. In 1977, residential consumption accounted for 37.1% of the total U.S. energy consumption. In 1978, this figure increased to 37.6%. The transportation sector increased its share of the total, from 26.2% in 1977 to 26.4% in 1978. However, the industrial sector's percentage of the total decreased from 36.7 in 1977 to 36.1 in 1978.

When examining the total energy consumption figure by fuel, it can be noted that petroleum consumption as a percentage of the total, is down .1% from 1977, natural gas is down by .4% and coal is down by .4% (affected by 5% decline in production due to coal miners' strike.)

On the other hand, hydropower and nuclear make up a larger percentage of the total consumption figure for 1978 than they did in 1977 (up .7 and .3 respectively). This is a result of increased levels of production in both areas. Petroleum imports decreased form 18.8 QBtu to 17.4 QBtu in 1978. (2)



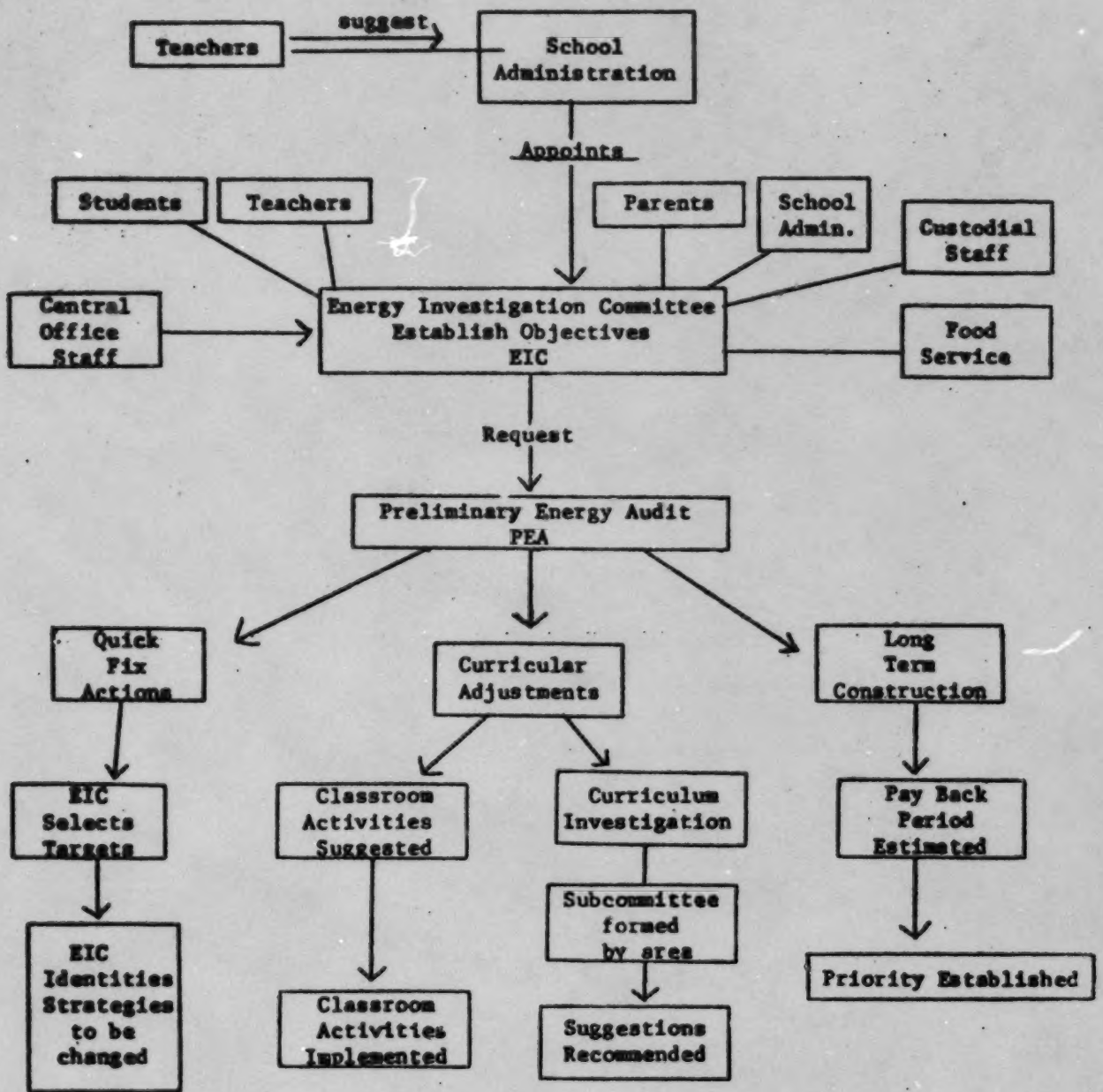
The president makes it clear that the rapid use of non-renewable energy sources is <u>not</u> a short term crisis but a long term situation that requires treatment of the cause. The long term (1000 years) solution will no doubt be electricity from solar or some other energy source. The interum solution while the oil barrel runs dry requires a modification by the classroom teacher to effect the changes that will result in a change of our current life style and a new energy use ethic. The old quick fix solution of add a module or a three week unit on energy has not been effective in creating the changes in life style restricted energy sources will create. It is now the responsibility of the teacher to again take a leadership role in helping the school become an energy laboratory to model

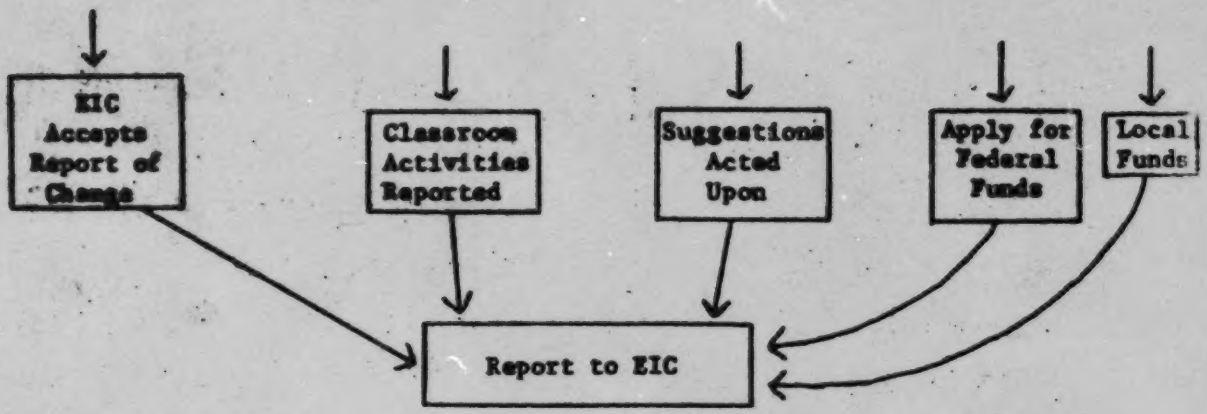
the most effective energy saving behavior.

The teachers are faced with several problems relative to the range of information available and the possible actions teachers may take. In considering information resources the teacher must overcome the credibility gap developed by the energy producers past treatment of the general public. The three major sources of information relative to energy use, production and distribution are the government, oil companies and electric companies. It is clear that hte conflicting data from these sources will require the teacher to be flexible in giving absolute answers to energy use and production questions. The teacher must help children explore a vast array of resources, current magazines, historical sources, government publications and forcast data to identify reliable information. The amount of information is vast but its specific relevence is limited.

The second problem is the establishment of the school as an energy laboratory. Borrowing from the past success in World War II where the school became a focus for community efforts to meet critical shortage needs. It is clear that the school is needed again. The establishment of an effective energy laboratory requires the full participation of all participants in the school. This is accomplished by the following flow chart.

Model for Energy Laboratory



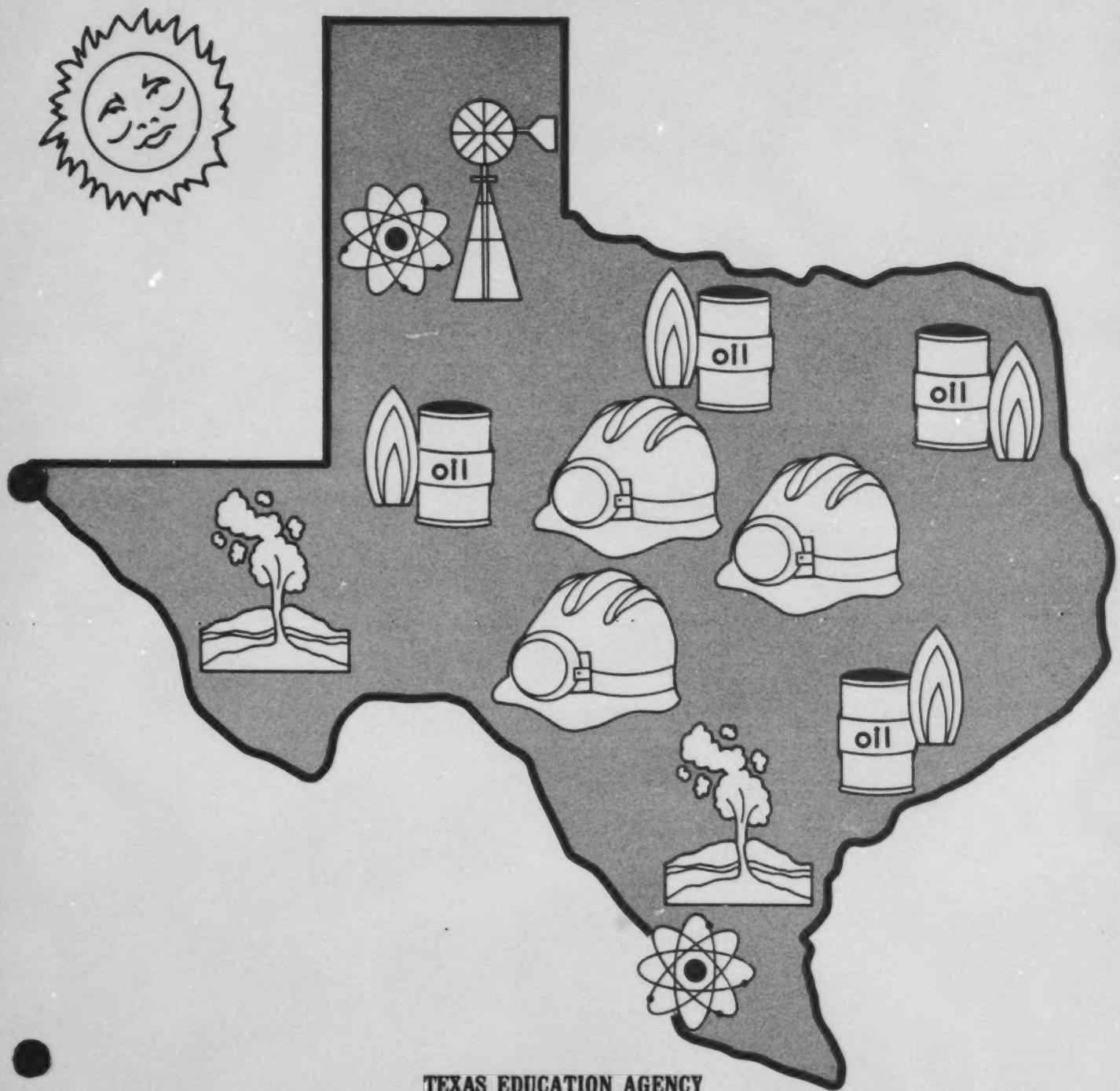

EIC Accepts Report of Change
Classroom Activities Reported
Suggestions Acted Upon
Apply for Federal Funds
Local Funds
Report to EIC

The energy laboratory model flow chart outlines the critical need for an Energy investigation committee EIC established for each school building. It is entirely possible that every school district could establish a district wide group but to truly meet the need for changes in options by students, it is important that a committee be established in each building. The School as an energy laboratory allows the teachers to integrate the curriculum activities with the overall goals of the EIC. The teachers must use students as a resource in identification of the alternative method of actions that will result in less energy consumed by the nation as a whole. The dynamics of the energy web require critical study of the total energy consumption matrix. A simple plan to eleminate evening athletics may result in less energy use at school but with more people staying at home during that time there may be a net energy use increase. Students are capable of accepting these challenges in redirecting the educational activities they are involved in. The school must become an energy laboratory if with the responsibilities for helping the community at large identify effective methods of energy conservation over the entire realm of energy sources. A model energy laboratory plan involves the following steps.

1. A school wide steering committee composed of students, teachers, custodians, cafeteria workers, & Administrators.
2. Have a Preliminary Energy Audit (PEA) of each building conducted consistant with the D.O.E. regulations for P.E.A.'s.
3. Identify Quick Fix suggestions to save from each committee member. A brainstorming session can accomplish this. If you feel there is not enough background in the committee, consider free circulars available from the local electric and gas utilities, the D.O.E. materials available from the Associated Universities at Oak Ridge, Tennessee or the National Science Teachers Association. A variety of films are available that provide many Quick Fix ideas.
4. Have the committee take charge and develop an implementation plan of the Quick Fix suggestions. Make sure a balance exists between suggestions that cost money eg. repair broken windows & install weather stripping on doors with no cost ideas like making sure return air vents are not blocked and thermostats are not obstructed.
5. Real support by the major school administratior is critical at this point. The school administrator must help supplement the suggested changes and draw attention to the contributions of the committee. Positive rewards to the student body for complying with the new life style must be built into the system.
6. Continuous support must exist along with random emphasis of the energy activities.

The school must involve all the constituents to truly serve as a leader in energy resource conservation. This workshop is designed to assist school administrators in identifying instructional strategies that will assure the curriculum reflects the changes in energy resources and information about energy audits and the efforts available to assist schools in quick fix energy conservation measures and securing funds for energy and conservation measures.

TEXAS ENERGY EDUCATION FRAMEWORK



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Division of Curriculum Development
Texas Education Agency
201 East 11th Street
Austin, Texas 78701
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FOREWORD

The *Texas Energy Education Framework* is designed to assist teachers, administrators, and other school personnel in the process of infusing energy education concepts into the public school curriculum. The *Framework* focuses on the basic concerns and needs of people as related to energy and suggests ways in which energy conservation can become a meaningful part of all disciplines in elementary and secondary schools.

We hope that the *Framework* will be a useful tool in helping young people become more aware of the critical decisions which we all face in meeting the present and future energy needs of our state and nation. The future of our society will depend in large measure on the thoughtfulness and wisdom of these decisions.

M.L. Brockette
Commissioner of Education

ACKNOWLEDGMENTS

ENERGY EDUCATION FRAMEWORK WRITING COMMITTEE

Betty Elvin
Science Teacher
Coldspring-Oakhurst Independent School District

Bill Holifield
Assistant Superintendent of Instruction
Plano Independent School District

Connie McQueen
Elementary Teacher
Temple Independent School District

Mike Owens
Consultant, Instruction
Region VII Education Service Center, Kilgore

Robert Reeves
Division Director, Special Services
Region I Education Service Center, Edinburg

Gail Riley
Social Studies Teacher
Hurst-Euless-Bedford Independent School District

Joseph Strehle
Director, Development and Resources
Region IV Education Service Center, Houston

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RATIONALE

The State of Texas assumes a position of national leadership in agricultural and industrial development. Its bounty of natural resources and variety of terrain and climate attract people from throughout the world. Texas' population is more than double that of the last decade. Texas citizens, like those across the nation, are enjoying the benefits of rapid technological development; life is becoming more comfortable, safe, and rewarding. These are very positive developments in which the people of Texas can take justifiable pride. Hard work and creative thinking, indeed, produce the "good life" in our state. Unfortunately, these same factors of rapid population growth and technological developments result in greater and greater demands on our state and national supply of energy. We are consuming energy faster than the supply is being replenished. The shortage is becoming more critical, and society depends on current and future decisions we make regarding our use of energy resources. Energy conservation is a most critical world, national, state, community, and personal priority.

Few people take issue with the fact that conservation of energy is essential. What is planned, developed, and accomplished in the area of energy conservation is the collective result of the individual efforts of Texas people. One person cannot even address a problem of this magnitude, let alone work out a solution. Each person can only react to the problem as it affects his or her personal life. There are certain basic concerns of people which relate directly to the quality of life they can expect to have. When people realize that the future availability of energy directly affects their personal health, ability to work, and ability to enjoy the fruits of their labor, they begin to take action.

This framework for energy education in Texas schools is designed to address the problem of energy consumption from the standpoint of each individual and to suggest the effect which wise use of energy can have on the quality of life. The basic concerns of all people include personal health and well-being, career choice and development, consumer activity, enjoyment of leisure time, and a satisfying role in society. This framework demonstrates how each person's use of energy directly affects these basic concerns. For example, a diminished supply of energy directly impacts the consumer. The price of gasoline continues to rise, thereby causing each person to spend a greater proportion of personal income on fuel. It also causes local shortages which restrict travel, spoil vacation plans, and even affect employment and home location. There are steps which each person can take to moderate the use of gasoline and therefore avoid family budget problems and inconveniences which a critical shortage would produce. This framework systematically addresses individual problems and focuses on the questions: "How can energy conservation affect me, and how will alternative energy resources affect me in the future?"

An effort is made to relate the basic concerns of people to experiences which they have as elementary school students, middle school students, and young adults in the high school. People of all ages have concerns related to personal health and well-being, career choice or development, recreation, money supply, and social interaction. The framework directs attention to these concerns and to the relationship of individual use of energy. The concepts, applications, and values are outlined in a K-Grade 12 continuum which is designed for infusion into the regular curriculum offerings of the school.

GOALS

The student will:

- Help to make conservation of energy a national, state, community, and personal priority
- Become aware of one's role as a consumer and conserver of energy
- Be familiar with the various types of energy and how they can be changed from one form to another
- Be familiar with the major career opportunities in the energy field
- Understand the legal/social implications in the production and use of various types of energy
- Understand the environmental and economic impact of the use of energy and the effect which this may have on each person's life style
- Understand the effect of energy production on the Texas economy

DESCRIPTION OF THE ENERGY EDUCATION MATRIX

The following Energy Education Matrix serves as a basis for formulation of the Texas Energy Education Framework. It is designed to ensure the development of learning activities directly related to the personal concerns of people. The basic concerns of people listed on the horizontal axis are:

- Consumer Behavior
- Personal Health and Well-being
- Career Choice and Development
- Leisure Time and Recreational Activity
- Social-Legal Interaction of People

It is assumed that students will need learning experiences in three basic dimensions which relate energy education to these personal concerns. These dimensions listed on the vertical axis of the Matrix are:

- Knowledge (Concepts)
- Applications of Knowledge (Activities)
- Values and Attitudes

The interaction of the basic concerns of people (horizontal axis) and the dimensions of learning (vertical axis) create 15 instructional development cells. For example, in Cell One, the interaction of personal consumer concern and content knowledge creates a base for design of learning content related to consumer behavior. Such topics as the relationship between energy supply and price, wise shopping for energy-efficient appliances, the effect of energy shortage on the quality of goods and services, the relationship to personal comfort, the cost effectiveness concept, and selection of clothing for different seasons could be developed using this cell as a planning base.

Cell Eight, created by the interaction of educational applications as related to career concerns of people, creates a planning base for student understanding of how changes in energy supply will affect job opportunities in future years. For example, the student will be able to see how new sources of energy such as wind, solar, and geothermal, will offer new career opportunities. Such concepts as the effect of energy shortage on the recreational industry, on new energy forms related to engineering job opportunities, and on applications of solar energy (including opportunities for development of extra-terrestrial collectors) would be included. The career opportunities exploration and selection process will undergo tremendous change in application during the coming years. All phases of curriculum should reflect not only changes in job opportunities but the need for early exploration, planning, and proper training for the world of work in the future. This cell, like all others, is only intended as a springboard in the area of curriculum planning and by no means presents all of the possible applications.

USE OF ENERGY EDUCATION CHARTS

The following charts present an array of examples delineating the kinds of learning experiences that could be designed using each of the 15 cells as a planning base. The curriculum designer or teacher can, from this kind of base, delineate a multitude of learning activities for each cell as they relate to science and social studies as well as to all other disciplines. The basic concepts and educational programs which follow are all based on the use of this Energy Education Matrix as a planning base. Items included, such as descriptors in the Matrix, are by no means all inclusive but only represent examples of the kinds of learning experiences that can be infused into all phases of the elementary and secondary school curriculum.

ENERGY EDUCATION MATRIX

	Consumer	Individual Well-Being	Career	Recreational	Socio-Legal
Knowledge	(1) Knowledge of energy conservation affects consumer behavior.	(2) Individual health and well-being are directly affected by energy use.	(3) Changing patterns of energy use and energy resources affect career opportunities now and in the future.	(4) Energy shortages and changing patterns of use affect the recreational activities of all people.	(5) Changing patterns of energy consumption and energy regulations affect individual lifestyle and the world society.
Application	(6) Applications of consumer knowledge relate to energy conservation.	(7) Application of energy conservation techniques improves individual health and well-being.	(8) Educational requirements for new jobs resulting from energy conservation and alternative resources are changing rapidly.	(9) Applications of information regarding wise use of energy affect the use of leisure time.	(10) Application of social-legal knowledge related to energy conservation and energy production affects the ability of each individual to live in harmony with other people of the world.
Values	(11) Consumer values affect the total use of energy.	(12) Personal values related to energy use affect the health and well-being of each individual.	(13) Career values and work ethics relate to the changing energy picture and job satisfa tion.	(14) Personal values regarding the use of energy for recreation affect the total consumption of energy.	(15) Social and political values are directly related to availability of energy and influence its research, transportation, and consumption.

INTRODUCTION TO MATRICES K-GRADE 3, GRADES 4-6, GRADES 6-8, GRADES 9-12

The need for energy education is critical and should be infused at all instructional levels and in all subjects. Toward this end, matrices of instructional cells for energy education have been developed for Kindergarten through Grade 3, for Grades 4 to 6, for Grades 6 to 8, and for Grades 9 to 12. Although school communities have their own expectations and their own needs, the matrices seek to show common concerns in energy education. ***The Framework for Energy Education*** aims at infusing the concepts of energy education in the Kindergarten through Grade 12 curricula while enlisting all students and educators in the energy management team.

The matrices on pages 6, 8, 10, and 12 are examples of how the goals for energy education can be expanded to include objectives for classroom activities. The matrices are not comprehensive lists of the knowledge, applications, or values applicable to energy education. The teacher may use the matrices as guides in developing his or her instructional program.

The Energy Education Curriculum Planning Activities on page 7, 9, 11, and 13 illustrate how individual instructional cells of the matrices are applicable to a number of subjects. Teachers are urged to reflect on their instructional sequences and focus appropriate segments on energy education goals.

GRADES K-3 MATRIX
OBJECTIVES FOR ENERGY EDUCATION

	Consumer	Individual Well-Being	Career	Recreational	Socio-Legal
Knowledge	The student will become aware that energy can be changed from one form to another.	The student will be aware of interdependence of energy use and personal comfort.	The student will be cognizant of energy uses in parents' jobs.	The student will be aware that the games we play use energy.	The student will become aware that our homes benefit from energy-efficient decisions.
Application	The student will be able to dramatize simple energy changes.	The student will recognize conditions which might affect heating and cooling devices.	The student will be aware that the nature of jobs changes with the source of energy used.	The student will be able to compare the relationship between physical motion and body heat.	The student will be aware of classroom rules that regulate classroom uses of energy.
Values	The student will determine ways to conserve energy at a personal level.	The student will realize one form of energy conservation is as simple as personal selection of clothing for each weather situation.	The student will determine how job choices affect the amount of energy use and how the community is affected.	The student will realize that there can be personal satisfaction in independent play without expending excessive energy.	The student will tolerate some degree of discomfort or loss of independence for the benefit of all.

→ SEE ENERGY EDUCATION ACTIVITIES EXAMPLE PAGE 7.

GRADES K-3 ENERGY EDUCATION ACTIVITIES

CAREER APPLICATION

THE STUDENT WILL BE AWARE THAT THE NATURE OF JOBS CHANGES WITH THE SOURCE OF ENERGY USED. The following activities illustrate how one instructional cell of the matrix is applicable to several subjects. This is not an exhaustive list of possible appropriate activities. The teacher should adapt these or other instructional activities to meet the particular needs of his or her students.

SUBJECT	CORRELATING ACTIVITIES
Language Arts and Social Studies	Students make a list of workers involved in building a house and indicate the use of energy in each of their jobs.
Science	Students interview workers who use alternative sources of energy in construction and ask how they increase home energy efficiency by using these different sources of energy.
Mathematics	Students compute the number of days different workers spend in building houses using energy-saving methods.
Art	Students make a mural showing the workers at various stages of building a house.
Music	Students make musical instruments from discarded building materials to develop an awareness of different sources of energy conservation.
Health	Students develop a simple dance in which they imitate the workers.
Reading	Students read stories related to construction with attention focused on the use of energy in the jobs of the workers.

GRADES 4-6 MATRIX

OBJECTIVES FOR ENERGY EDUCATION

	Consumer	Individual Well-Being	Career	Recreational	Socio-Legal
Knowledge	The student will be aware that consumer decisions are usually directed by one's particular environment or culture.	The student will be aware that the sufficient supply of energy depends essentially on lifestyles and the wise use of natural resources.	The student will be aware that the field of energy offers major career opportunities and satisfying work experiences.	The student will be aware that the supply of world energy affects the way we use leisure time.	The student will be aware that the supply and use of energy are directly related to the world's economic and political well-being.
Application	The student will identify the usability span of different types of beverage containers and will recognize the role of energy in recycling.	The student will be aware of wasteful uses of energy at home and at school and will determine measures which increase the sufficient supply of energy.	The student will identify energy related jobs in society today.	The student will evaluate favorite recreational activities and determine the type of energy used.	The student will recognize that supply and use of energy have an impact on the community, state, nation, and world.
Values	The student will recognize cultural differences in energy use patterns.	The student will recognize how the use of energy affects individual well-being and the fate of generations to come.	The student will be aware of alternative energy resources that could be used to maintain the current lifestyle.	The student will understand how decisions, lifestyle, and leisure time affect energy efficiency.	The student will compare energy uses that are important only for personal comfort or convenience in the home and community.

→ SEE ENERGY EDUCATION ACTIVITIES EXAMPLE PAGE 9.

GRADES 4-6 ENERGY EDUCATION ACTIVITIES

INDIVIDUAL WELL-BEING AND KNOWLEDGE

THE STUDENT WILL BE AWARE THAT THE SUFFICIENT SUPPLY OF ENERGY IN THE UNITED STATES DEPENDS ESSENTIALLY ON LIFESTYLES AND THE WISE USE OF NATURAL RESOURCES. The following activities illustrate how one instructional cell of the Energy Concerns Matrix is applicable to several subjects. This is not an exhaustive list of possible appropriate activities. The teacher should adapt these or other instructional experiences to meet the particular needs of his or her students.

SUBJECT	CORRELATING ACTIVITIES
Language Arts	The class will compile a newspaper about energy sources and conservation. Include headlines, news stories, feature stories, editorials, letters to the editor, cartoons, and advertisements on energy sources and on how energy could be conserved. The writing of the editorials could be used as a class contest or expanded into a school-wide contest.
Spelling	Introduce the spelling of energy related words. Students participate in class or school "spelling bees."
Reading	Students write a simple poem about the wise use of energy or about alternative energy sources. Poems are read aloud to the reading group.
Mathematics	Students prepare a chart of temperatures in the classroom/school. Chart shows the monthly fuel cost.
Science	Students keep records of their use of electricity for one day, noting the purpose of each energy use and the ways energy could be conserved.
Social Studies	Students list items available for use in the home which are considered luxury items, convenience items, and necessity items and do a comparative study of costs in terms of energy usage.
Art	Students design logos and slogans that will inform people about the need to conserve energy. Students paint a mural using these logos and slogans. After securing permission from local merchants, students reproduce the mural on a store window to further public awareness of need for energy conservation.
Music	Students make a class collection of songs related to energy and learn to sing the songs. Using some of the songs they have learned, students write and produce a play to be presented for the student body.
Health	Students compare health problems of the United States to those of countries that have less energy available and determine the role of energy in providing good health care.

GRADES 6-8 MATRIX
OBJECTIVES FOR ENERGY EDUCATION

	Consumer	Individual Well-Being	Career	Recreational	Socio-Legal
Knowledge	The student will be aware that energy is transformed with a loss of energy during each transformation.	The student will be aware of interdependence of energy use and personal comfort.	The student will be aware of various career opportunities involved in the transformation of energy from source to usable product.	The student will be aware of interdependency of energy use and personal comfort. →	The student will be aware that transformation of energy from source to usable product presents environmental and economic issues.
Application	The student will be cognizant of the forms of energy used to produce basic food groups.	The student will understand that temperatures vary over different surfaces, such as earth, plants, or fabrics.	The student will be aware of careers associated with energy transformation.	The student will relate favorite recreation activities to energy requirements of each.	The student will be able to identify uses of land and compare job opportunities and economic importance of each use.
Values	The student will understand the nutrition and energy economics of food groups.	The student will be aware of advantages and disadvantages of adjusting lifestyles to maximum energy efficiency.	The student will understand that career choices are affected by availability of energy or by alternative sources of energy.	The student will recognize personal satisfaction associated with favorite recreational activities in terms of energy cost.	The student will be aware of advantages and disadvantages of different land uses and of how the use of land affects choices people have.

→ SEE ENERGY EDUCATION ACTIVITIES EXAMPLE PAGE 11.

GRADES 6-8 ENERGY EDUCATION ACTIVITIES

SOCIO-LEGAL AND KNOWLEDGE

THE STUDENT IS AWARE THAT TRANSFORMATION OF ENERGY FROM SOURCE TO USABLE PRODUCT PRESENTS ENVIRONMENTAL AND ECONOMIC ISSUES. The following activities illustrate how one instructional cell of the Energy Concerns Matrix is applicable to several subjects. This is not an exhaustive list of possible appropriate activities. The teacher should adapt these or other instructional experiences to meet the particular needs of his or her students.

SUBJECT	CORRELATING ACTIVITIES
Language Arts	Students interview senior citizens and compare to the present the lifestyles and economic and environmental problems of earlier days when energy use was not as limited. Students interview senior citizens to determine what alternative energy sources were used before present-day energy sources were available.
Social Studies	Students investigate the environmental and economic impact on the community of the use of various types of energy.
Science	Students design an experiment to change energy from one form to another.
Health	Students compare types of current health problems of the community with health problems of earlier days when energy use was a fraction of present use.
Mathematics	Students plot the economic value of energy produced and the cost of dealing with environmental problems incurred.
Art	Students make a diorama of events in earth history that have caused resources to be concentrated in certain locations.
Music	Students experiment with amounts of electrical energy required to produce sounds in various instruments and in amplifier systems.

GRADES 9-12 MATRIX
OBJECTIVES FOR ENERGY EDUCATION

	Consumer	Individual Well-Being	Career	Recreational	Socio-Legal
Knowledge	The student will understand that energy conservation and alternative energy sources will affect consumer behavior.	The student will be aware of the interdependence of personal well-being and comfort and energy consumption.	The student will understand that changing patterns of energy use and alternative sources of energy affect career opportunities now and in the future.	The student will be aware of how the availability of energy and efforts to conserve will affect recreation and lifestyle.	The student will understand that improved energy conservation practices and alternative sources will cause major changes in individual lifestyle and world society.
Application	The student will describe an energy-efficient home, car, school, and appliance.	The student will provide examples of how group and individual well-being are improved by energy conservation in areas of transportation, housing, and recreation.	The student will identify major changes which energy conservation practices or which alternative sources of energy will have on job opportunities in the major occupational clusters.	The student will list and compare energy efficient vs. inefficient recreational activities in the areas of travel, sports, hobbies, and home care.	The student will list major changes in law or social customs which have taken place in the areas of transportation, housing, and recreation as a result of energy shortage.
Values	The student will list the specific advantages and disadvantages of acquiring an energy-efficient home, car, or appliance.	The student will be able to understand the effects of energy-efficient decisions related to transportation, housing, and recreation on personal comfort and well-being.	The student will list the changes which have occurred in his or her parents' careers as a result of changing energy availability or sources and how this has affected their priorities in life.	The student will identify changes which have occurred and project future changes in his or her recreation lifestyle as a result of the current energy situation.	The student will be able to compare the present and projected laws and customs in the areas of transportation, housing, and recreation as a result of energy conservation practices.

→SEE ENERGY EDUCATION ACTIVITIES EXAMPLE PAGE 13.

GRADES 9-12 ENERGY EDUCATION ACTIVITIES

INDIVIDUAL WELL-BEING AND APPLICATION

THE STUDENT WILL PROVIDE EXAMPLES OF HOW GROUP AND INDIVIDUAL WELL-BEING ARE IMPROVED BY ENERGY CONSERVATION IN AREAS OF TRANSPORTATION, HOUSING, AND RECREATION. The following activities illustrate how one instructional cell of the Energy Concerns Matrix is applicable to several subjects. This is not an exhaustive list of possible appropriate activities. The teacher should adapt these or other instructional experiences to meet the particular needs of his or her students.

SUBJECT	CORRELATING ACTIVITIES
Language Arts and Language Learning	Students debate voluntary changes vs. governmental control as a necessity to make changes in energy consumption.
Social Studies	Students interview people who rode trains 30 years ago and people who have ridden trains recently and compare their experiences. Students debate the merits of mass transportation as an energy-saving method.
Science	Students place glass microscope slides covered with petroleum jelly in the exhaust of three different vehicles and compare the amounts of particulate matter expelled.
Health	Students predict the air pollution effect if no students drove cars to or from school.
Mathematics	Students design a scale to rate well-being of individuals riding in a vehicle and graph comparisons of different size cars.
Art	Students express one person's feelings about the need for energy conservation in areas of transportation, housing, and recreation.
Music	Students develop a rhythmic choral reading to compare the sound levels of different kinds of transportation.

COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) non-discrimination in extracurricular activities and the use of school facilities;

(4) non-discriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) non-discriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

SECTION 504, REHABILITATION ACT OF 1973; EDUCATION OF THE HANDICAPPED ACT (P.L. 94-142)

No qualified handicapped person will, on the basis of handicap, be excluded from participation in, be denied the benefits of, or otherwise be subject to discrimination under any program or activity operated by the Texas Education Agency. The Texas Education Agency makes positive efforts to employ and advance in employment qualified handicapped individuals.

TITLE IX, CIVIL RIGHTS ACT OF 1964

No person shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity operated by the Texas Education Agency.

Quick Fix Energy Checklists

for Region VII Education Service Center School Administrators

This section provides three checklists to be reproduced for each participant relative to Electricity and Heating, Ventilation and Air Conditioning, and Transportation. In addition a special section for secondary schools by sufficient matter is provided. This activity should be intergrated with a discussion of priorities and how to manage the local problem of energy use.

Caution! The checklists often involve detailed discussion as to the feasibility of some practices. It is the goal of this activity to solicit comments and discussion but not argument. Stress the availability of an energy audit from the governors council of energy resources or the local power companies. Ask groups to gather in small groups to rank the possible practices they may use in their local school.

Quick Fix Energy Saving Measures
for
ELECTRICITY AND LIGHTING
in
Region VII Education Service Center Administrators

There has been a constant escalation of electrical use in schools for the past thirty years. Lighting levels have tripled, air conditioning is commonplace and the current trend in school architecture is to build climate controlled, sealed environments. These trends have resulted in the situation where over ninety percent of the schools' electrical budget is used for lighting and climate control. The practices listed on the checklist are a compilation of suggestions from the Department of Energy, Ventura County Schools, and the Texas Governors' Council of Energy Resources as effective in reducing this huge energy drain. Some of these practices represent a departure from traditional procedures. Because every school is different you should conduct a complete energy audit for a better view of your school. The basic need for reading is 50 foot candles. Consider windows, skylights and other natural systems to supplement your lighting system. The best practice is one which involves changes in behavior of the responsible people. Involve students, teachers and maintenance personnel to change their actions toward a more energy conservation consciousness.

Quick Fix Energy Saving Measures
for
ELECTRICITY AND LIGHTING
in
Region VII Education Service Center Administrators

Please place a check in the appropriate column for each item.	Current Practice	Possible Practice	Next Step
1. Secure electrical energy utilization data to individual schools each month.			
2. Replace indoor and outdoor incandescent lighting with florescent or mercury vapor lighting.			
3. Replace florescent tubes after 80% of their lamp life.			
4. Clean florescent tubes at least every six months.			
5. Lower the temperature setting for electric hot water hesters to the lowest level acceptable.			
6. Turn lights off in unused classrooms.			
7. Reduce lighting levels in cafeterias, gymnasiums, common areas and halls to lowest levels based upon safety requirements. 50 foot candles or less.			
8. Reduce excessive holiday lighting.			
9. Eliminate all possible lighting during non-use hours.			
10. Instruct night custodians to light only the rooms and areas they are cleaning at the time.			
11. Use only full washer and dryer loads in school laundries.			
12. Schedule daylight cleaning when possible.			

Developed by R M. Jones and Mike Owens

	Current Practice	Possible Practice	Next step
13. Reset automatic timers regularly to utilize all available daylight.			
14. Turn off electric typewriters and other clerical equipment when not in use.			
15. Reduce use of appliances, coffee pots, and room heaters.			
16. Restrict use of parking lot lights to times when school activities are held.			
17. Schedule meetings into facilities of the proper size.			
18. Paint walls, and ceilings with light reflective colors.			
19. Investigate the use of dimmer switches and separate lighting circuits for areas which are not in constant use.			
20. Install switches in rooms so that light near windows can be turned off when there is sufficient natural light.			
21. Sub-meter electricity so that a true charge by building can be determined.			
22. (List your own suggestion) 23. (List your own suggestion) 24. (List your own suggestion)			

Developed by R. M. Jones and Mike Owens

Quick Fix Energy Saving Measures for

HEATING, VENTILATION AND AIR CONDITIONING
in
Region VII Education Service Center Administrators

The Ventura County publication made the point that "The prevailing temperatures in today's classrooms are a product of our culture and not requirements of our bodies. Nor does lowering the temperature in winter or increasing it in the summer to current recommended energy-saving levels effect health, learning or achievement." While some practices in this area are also effective in electrical energy savings, the complex intermingling of natural gas, fuel oil, and steam with electrical energy generation require specific considerations in how we heat and cool our schools. The practices listed on the checklist are a complication of suggestions from the Department of Energy, Ventura County Schools, and the Texas Governors' Council of Energy Resources as effective in reducing this huge energy drain. Some of these practices represent a departure from traditional procedures. Because every school is different you should conduct a complete energy audit for specific changes in equipment and construction. These suggestions involve little or no cost.

Quick Fix Energy Saving Measures for
HEATING, VENTILATION AND AIR CONDITIONING
in
Region VII Education Service Center Administrators

Please place a check in the appropriate column for each item.	Current Practice	Possible Practice	Not Currently Feasible
1. Minimize utilization of portable heating and cooling units.			
2. Establish appropriate local settings in all classrooms.			
3. Regularly check the accuracy and efficiency of all temperature controls.			
4. Investigate the utili-ation of natural heating and cooling cycles through ventilation and open window controls.			
5. Do not restrict air flow around thermostats, and vents.			
6. Do not change thermostat settings to increase rate of cooling and heating.			
7. Shut off or put on automatic night time setback all heating, cooling and equipment during non-school hours and vacations			
8. Investigate the use of drapes and blinds for passive thermal control.			
9. Conduct staff inservice on the operation of heating, cooling, and ventilation controls.			
10. Conduct regular inspection, cleaning, and maintenance of all heating, cooling and ventilation systems.			
11. Consolidate summer school classes, night classes, and meetings in adjacent rooms to eliminate excess air conditioning.			

Developed by R. M. Jones and Mike Owens

	Current Practice	Possible Practice	Not Currently Feasible
12. Install automatic door-closing devices.			
13. Close or cover baffles and vents on cooling systems during the heating season.			
14. Investigate the use of heat recovery devices to utilize exhaust air.			
15. Implement a cooperative information program to inform children and parents about proper seasonal dress.			
16. Investigate the use of solar energy as a supplementary heating source.			
17. Check for leaks in weather stripping around windows & doors.			
18. Keep thermostats free of direct sun & heat producing lamps or appliances.			
19. (List your own suggestion)			
20. (List your own suggestion)			

Developed by R. M. Jones and Mike Owens

Quick Fix Energy Saving Measures
in
TRANSPORTATION
for
Region VII Education Service Center Administrators

The school has accepted the responsibility of transporting students to its facilities, on field trips, to athletic events and to extra-curricular activities of a broad nature. In addition, more and more students, faculty and staff are driving their personal vehicles to school and on school business. Staff inservice, student transportation programs and volunteer vehicle sharing can have enormous impact on our utilization of gasoline and other petroleum products. The practices listed on the checklist are a compilation of suggestions from the Department of Energy, Ventura County Schools, and the Texas Governors' Council of Energy Resources as effective in reducing this huge energy drain. Some of these practices represent a departure from traditional procedures. Because every school is different you should consult all persons involved in transportation to develop realistic goals and plans.

Quick Fix Energy Saving Measures
in
TRANSPORTATION
for
Region VII Education Service Center Administrators

Please place a check in the appropriate column for each item.	Current Practice	Possible Practice	Next Step
1. Review security procedures for all vehicles, storage tanks, and pumping facilities.			
2. Conduct inservice for all drivers and maintenance personnel on fuel efficient operation of vehicles.			
3. Utilize trip recorders or logs to record vehicle operation data.			
4. Utili e a central vehicle checkout operation data to consolidate trips.			
5. Investigate the utilization of intermediate size buses and vans for small group transportation.			
6. Develop incentive programs for walking, bicycling, and car pooling for students and staff.			
7. Investigate changing attendance boundaries to reduce trip distances.			
8. Reduce school year to minimum number of days legally mandated.			
9. Combine field trip requests from more than one class or school to insure full bus loads.			
10. Coordinate athletic even schedules to allow several teams to travel together in vehicles.			
11. Investigate sharing vehicles with neighboring districts for all athletic and scholastic events.			

Developed by R M. Jones and Mike Owens

	Current Practice	Possible Practice	Next step
12. Encourage employees to eat lunch on campus or at their work station.			
13. Use closed circuit television or conference calls for staff meetings.			
14. Have regular maintenance of vehicles including change of air cleaner.			
15. Install cruse controls on vehicles and set governors at a maximum of 55 mph.			
16 Remove unnecessary weight from vehicles.			
17. Purchase smaller energy efficient cars for staff use.			
18. (List your own suggestion)			
19. (List your own suggestion)			

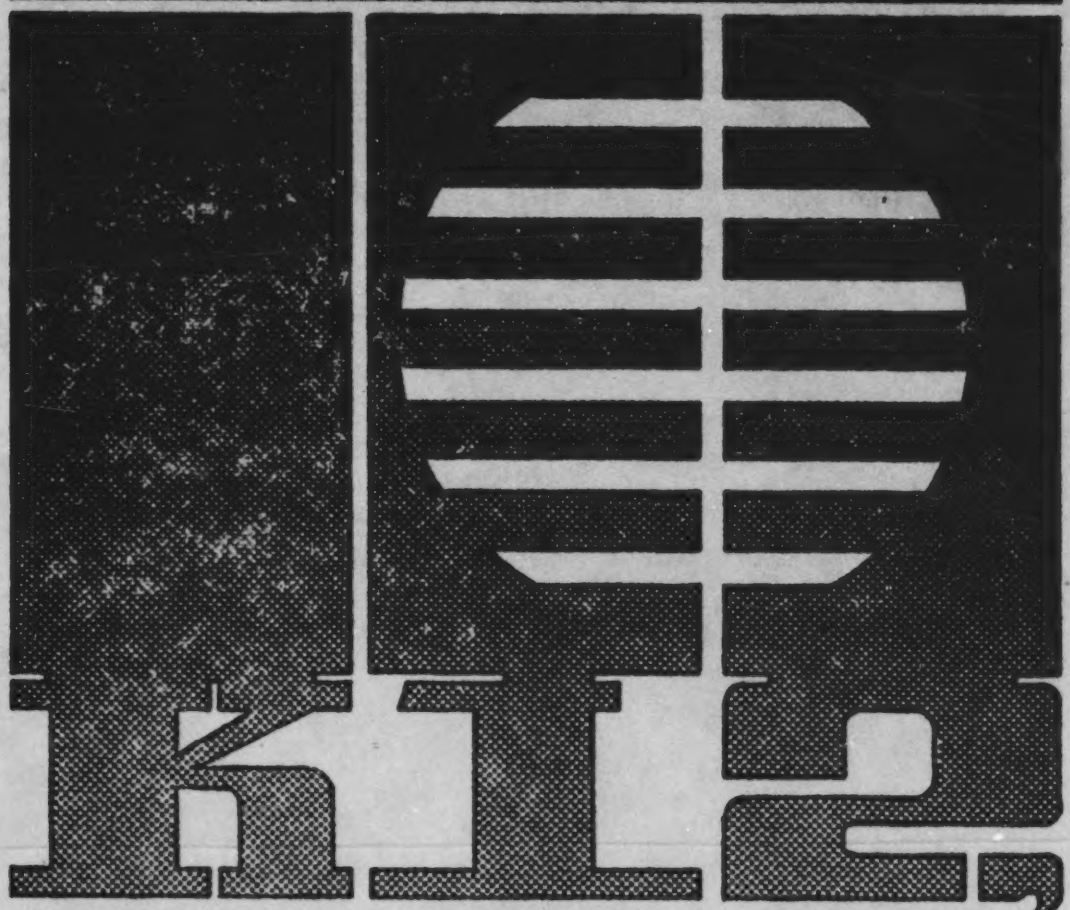
Developed by R. M. Jones and Mike Owens

The following resource guide is an excellent grouping of the available curriculum materials in Energy Education. The complete book should be purchased by any school interested in providing an Energy Education Program. The referenced materials are organized by grade level in the later chapters of the book.

HCP/M8685-01
UC-13

May 1978

Volume 1
Energy Education Materials Inventory



An Annotated Bibliography of Currently Available Materials, K-12, Published Prior to May, 1976.

Prepared for
U.S. Department of Energy
Assistant Secretary for Conservation and Solar Applications
Office of Marketing and Education
Washington, DC 20545

Under Contract No. EC-77-C-01-8685

Available From:
National Technical Information Service (NTIS) U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

Price:

Printed Copy:	$11.75
Microfiche	$ 3.00

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For information about currently available energy education materials published by the Department of Energy write to the U. S. Department of Energy, Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830. For a listing of films available on free loan, ask for the Energy Films Catalog; for a listing of free booklets and curriculum materials, ask for the Selected Department of Energy Publications.

I. MEDIA

A. Audiovisual

1. Audiocassettes and Records

ALTERNATIVES TO BURNING

The Center for Cassette Studies, 8110 Webb Avenue, N. Hollywood, CA 91605
Price: $14.95 Level: 7-12
Dr. Robert Rienow discusses alternative methods of energy production. He concludes that we must find new approaches to energy production that do not pollute.

CONTEMPORARY AMERICAN SERIES: POPULATION & RESOURCES

Educational Record Sales, 157 Chambers Street, New York, NY 10007
Price: $5.50 Level: 7-12
On this album, a panel of educators discuss convergent problems of population increase and resource decline. The discussions provide a stimulus for class interaction or outside research.

DARKNESS FOR OUR CITIES

The Center for Cassette Studies, 8110 Webb Avenue, N. Hollywood, CA 91605
Price: $14.95 Level: 7-12
This is a discussion of America's energy crisis. Dr. Robert Rienow, an authority in environmental sciences, presents statistics that are frightening.

ENERGY & FOOD PRODUCTION: CONTEMPORARY TECHNOLOGY & ALTERNATIVES

American Association for the Advancement of Science Audiotape Program, Dept. QA, 1515 Massachusetts Avenue NW Washington, DC 20005
Price: $36.00 Level: 11-12
This is a discussion of the relationship between energy consumption and food production. The importance of new production methods and technology is emphasized.

ENERGY & OUR ENVIRONMENT (1970)

Coronet Films, 65 E. So. Water Street, Chicago, IL 60601
Price: $50.00 Level: 4-12
This tape introduces the problem of energy needs versus environmental concerns. A teacher's guide with teaching suggestions is included.

ENERGY & SOCIETAL DEVELOPMENT

American Association for the Advancement of Science Audiotape Program, Dept. QA, 1515 Massachusetts Avenue NW
Washington, DC 20005
Price: $19.95 Level: 11-12
This is a taped lecture by Chauncey Starr (President, Electric Power Research Institute, Palo Alto, California). Mr. Starr explores changing energy demands as societal priorities change.

THE ENERGY CRISIS: SOME IMPLICATIONS & ALTERNATIVES

American Association for the Advancement of Science Audiotape Program, Dept. QA, 1515 Massachusetts Avenue NW
Washington, DC 20005
Price: $12.00 Level: 11-12
This is a three-hour taped dialogue between noted authorities (Dean Abrahamson, U. of Minnesota; James Fay, M.I.T.) which examines components of societal energy demand. Ideas for changing life-styles to reduce energy demand are explored.

THE EXPLOITATION OF NATURAL RESOURCES

The Center for Cassette Studies, 8110 Webb Avenue,
N. Hollywood, CA 91605
Price: $12.00 Level: 10-12
This text reveals the exploitation of the resources of developing nations by the industrialized nations. It makes the point that the growing energy crisis has resulted from over-consumption of our non-renewable resources.

FREE LAND & ABUNDANT RESOURCES

The Center for Cassette Studies, 8110 Webb Avenue,
N. Hollywood, CA 91605
Price: $12.95 Level: 10-12
This is an analysis of the roots of U.S. affluence and prosperity. Professor Peter Odegard speaks of how the American dream of equality and freedom was rooted in free land and abundant resources.

FUSION ENERGY: POWER OF THE FUTURE

The Center for Cassette Studies, 8110 Webb Avenue,
N. Hollywood, CA 91605
Price: $12.95 Level: 7-12
In this text a panel discusses the prospects of fusion power. The panel has some skeptical questions, but the consensus is that fusion power offers great promise.

FUSION POWER

American Association for the Advancement of Science Audiotape Program, Dept. QA, 1515 Massachusetts Avenue NW Washington, DC 20005
Price: $19.95 Level: 11-12
This is a review of the U.S. program to develop a thermonuclear fusion power source. It explains the alternative forms such a generator might take and their environmental impact (Rolf Sinclair, National Science Foundation; Robert Bussard, U.S. Atomic Energy Commission)

HORSEPOWER

The Center for Cassette Studies, 8110 Webb Avenue, N. Hollywood, CA 91605
Price: $12.95 Level: 4-12
This documentary describes, contrasts, and measures the efficiency of different "power plants." Man makes many machines, but nature can show us some engineering marvels as well.

THE INTERNAL COMBUSTION ENGINE

The Center for Cassette Studies, 8110 Webb Avenue, N. Hollywood, CA 91605
Price: $12.95 Level: 4-12
This is the story of a series of unrelated discoveries adding up to one of the greatest or most destructive inventions of all time. It is the history of the cylinder and piston.

LET'S THINK ABOUT SCIENCE SERIES: PRETEND YOU'RE A MOLECULE & DANCE; HURRAH FOR THE SUN

Troll Associates, 320 Rt. 17, Mahwah, NJ 07430
Price: $5.50 each Level: 1-4
In these cassettes, science concepts are introduced to children through enjoyable activities. These activities introduce molecular action and structure.

NON-NUCLEAR ENERGY FOR DEVELOPMENT: SESSIONS I-IV

American Association for the Advancement of Science Audiotape Program, Dept. QA, 1515 Massachusetts Avenue NW, Washington, DC 20005
Price: $19.95/first session Level: 11-12
$16.95/each additional session
This is a taped discussion of the current and future world energy situation as it affects the Americas. Particular attention is given to the developing nations. (J. Fredrick Weinhold, Ford Foundation; Edmando de Alba, National Council of Science & Technology, Mexico)

OIL FROM THE OCEANS: PROMISES & PROSPECTS

American Association for the Advancement of Science Audiotape Program, Dept. QA, 1515 Massachusetts Avenue NW, Washington, DC 20005
Price: $18.00 Level: 11-12
This is a taped discussion of the potential for increased offshore oil production. The focus is on problems to be overcome and the technology needed.

OUTER SPACE

Children's Book & Music Center, 5373 W. Pico Blvd., Los Angeles, CA 90019
Price: $8.95 Level: K
This short play allows students to become involved at different learning levels. It is a multimedia experience which introduces basic energy-flow concepts.

THE PLACE OF NUCLEAR POWER

The Center for Cassette Studies, 8110 Webb Avenue, N. Hollywood, CA 91605
Price: $14.95 Level: 7-12
Some predict that fission energy is merely an interim source and they insist that fission will give way to fusion power in a few decades. Others insist that breeder reactors, which produce their own fuel, will take over energy production.

POWER FOR THE PEOPLE

The Center for Cassette Studies, 8110 Webb Avenue, N. Hollywood, CA 91605
Price: $15.95 Level: 10-12
Human and beast, wind and water, sunbeams and atoms - all have been harnessed to produce power, but we are still in danger of running short. This cassette explains how this situation came about and some of the new ways being devised to cope with it.

POWER GENERATION & ENVIRONMENTAL CHANGE: RECONCILING MAN'S DESIRE FOR POWER WITH THE NEEDS OF HIS ENVIRONMENT: SESSIONS I-II

American Association for the Advancement of Science Audiotape Program, Dept. QA, 1515 Massachusetts Avenue NW, Washington, DC 20005
Price: $19.95/first session Level: 11-12
$16.95/second session
This tape discusses three alternative means of power generation - nuclear, hydroelectric, and fuel combustion. The emphasis is on controlling the environmental effects of each. (Arthur Squires, City College of The City University of New York; David Berkowitz, MITRE Corp.)

THE RESOURCES OF POWER

The Center for Cassette Studies, 8110 Webb Avenue,
N. Hollywood, CA 91605
Price: $15.95 Level: 10-12
This is an examination of the use and abuse of power stemming from the ownership and exploitation of natural resources. It focuses on the underdeveloped world and Canadian-American relations.

RESOURCES TODAY & TOMORROW

The Center for Cassette Studies, 8110 Webb Avenue,
N. Hollywood, CA 91605
Price: $15.95 Level: 10-12
This cassette points out that many of the world's resources are being consumed in an irreversible manner at increasing rates. It emphasizes that technological development will place an intensifying demand on the finite human environment.

SCIENTIST DIXY LEE RAY

The Center of Cassette Studies, 8110 Webb Avenue,
N. Hollywood, CA 91605
Price: $16.95 Level: 7-12
In this cassette, Dr. Dixy Lee Ray predicts that sixty percent of our energy will be nuclear supplied by the year 2000, pollutant free and safe. She answers objections to atomic plants by pointing out that it took eons for primitive cultures to overcome fear of fire and that new logic and planning systems can insure safety.

THE SEARCH FOR OIL

The Center for Cassette Studies, 8110 Webb Avenue,
N. Hollywood, CA 91605
Price: $12.95 Level: 4-12
This is a story of the discoveries and advancements in oil production. It tells the story of oil from prehistoric times to its evolution as the life blood of the modern mechanical age.

SHAVING THE FACE OF THE EARTH

The Center for Cassette Studies, 8110 Webb Avenue,
N. Hollywood, CA 91605
Price: $16.95 Level: 10-12
In every state of the Union, mountains have been reduced to ugly rubble, rivers have been polluted and wildlife has been destroyed by strip mining. In this cassette, Harry Caudill points out some evils of strip mining.

I. MEDIA

A. Audiovisual

3. Filmstrips and 8mm Filmloops

THE ATOM: MAN'S SERVANT

Encyclopedia Britannica Education Corporation,
425 N. Michigan Ave., Chicago, IL 60611
Price: $49.50 Level: 7-9
An animated atom is the key symbol in this series of six filmstrips describing the basic concepts of the nature of atomic energy. Diagrams and action photography are used to point out the diverse uses of the atom.

ATOMIC ENERGY: A SERIES

Visual Sciences, Box 599, Suffern, NY 10901
Price: $15.00 Level: 9-12
This five-filmstrip series includes pictures, charts, and diagrams. It covers atomic safety procedures, history of atomic research, and atomic structure.

ATOMIC PHYSICS: HISTORY OF THE ATOM

Universal Education and Visual Arts,
100 Universal City Plaza, Universal City, CA 91608
Price: $34.00 Level: 7-12
This series of filmstrips explains the nature of the atom and traces the history and beliefs surrounding it. It also develops the theme of current and future applications for peaceful purposes.

ATOMS & THEIR ENERGY

United Learning, 6633 West Howard Street, Niles, IL 60648
Price: $30.00 Level: 5-9
This filmstrip introduces basic principles of atomic structure and how atoms hold and release energy. It is suitable as a supplement in chemistry or physics.

BASIC ELECTRICAL PRINCIPLES

Singer Education Division, Society for Visual Education,
1345 Diversey Parkway, Chicago, IL 60614
Price: $54.00 Level: 6-9
The set contains four filmstrips, two records or cassettes, and four teacher's guides. It includes demonstrations which define an electric current and illustrates methods of calculating and measuring electricity.

BASIC RESOURCES (Two Parts)

Educational Design, Inc., 47 West 13 Street,
New York, NY 10011
Price: $29.50 (with cassette) Level: 7-12
Air, water, land, vegetation, and animal life have determined human settlement patterns and life styles. Part 1 shows cultural activities that are based on these resources, while Part 2 focuses on trees and concludes with a look at Germany's Black Forest.

BONNEVILLE DAM: POWER HOUSE OF THE COLUMBIA RIVER

Singer Education Division, Society for Visual Education,
1345 Diversey Parkway, Chicago, IL 60614
Price: $18.50 Level: 6-9
This is a full-color, sound filmstrip with a teacher's guide. It examines one of the key units in the development of hydroelectric power on the Columbia River.

CHEMICAL CHANGE: COMBINATION & SEPARATION SERIES

Hubbard, Inc., P. O. Box 105, Northbrook, IL 60062
Price: $175.00 Level: 9-12
This is a series of seven super 8mm filmloops. It shows various chemical combinations and separations and the concepts that deal with water and light energy interaction.

COMMUNITY FOOD ENERGY FLOW

Singer Education Division, Society for Visual Education,
1345 Diversey Parkway, Chicago, IL 60614
Price: $19.50 Level: 6-9
Through full-color nature photography, this sound filmstrip introduces the concept of food energy flow through food chains and food webs. A teacher's guide is included.

CONCEPTS IN SCIENCE SERIES, SET IV

Eye Gate Media, 146-01 Archer Ave, Jamaica, NY 11435
Price: $74.70 (with cassettes) Level: 7-9
This set of six filmstrips explores the physical world. Weights and measures, energy, weather, heat, seasons, and the earth's surface are concepts that are covered.

CONCEPTS IN SCIENCE SERIES, SET VI

Eye Gate Media, 146-01 Archer Ave., Jamaica, NY 11435
Price: $74.70 (with cassettes) Level: 7-9
This set of six filmstrips is designed to augment science instruction. The human body, weather forecasting, electrical energy, and the classification of living things are studied.

CONSERVING RESOURCES SERIES: MINERAL RESOURCES

H. M. Elkins Co., 10031 Commerce Ave.,
Tujunga, CA 91042
Price: $6.00 Level: 4-8
The filmstrip is a survey of our nation's natural resources. It explains how resources affect the lives of people in different regions.

EARTH, ENGINES & INGENUITY: HISTORICAL SOURCES OF ENERGY

Multi-Media Products, Box 5097, Stanford, CA 94305
Price: $11.95 Level: 9-12
This filmstrip explores the development of an energy consuming society. It includes the history of machines and energy.

THE ECOLOGICAL CRISIS

Q + ED Productions, P. O. Box 1608, Burbank, CA 91505
Price: $81.50 (records) Level: 7-12
$87.50 (cassettes)
This is a study of human survival on our planet. It presents the issues of overpopulation, diminishing food supply, environmental pollution, urban congestion, and ecological disturbance.

ECOLOGY: UNDERSTANDING THE CRISIS

Encyclopedia Britannica Education Corporation,
425 N. Michigan Ave., Chicago, IL 60611
Price: $86.95 Level: 4-9
Ecology holds the key to understanding today's environmental crisis--an understanding vital to the survival of our planet. This filmstrip includes a study of a natural ecosystem undisturbed by man and suggestions for turning the tide of ecological destruction.

ELECTRICAL ENERGY

Singer Education Division, Society for Visual Education,
1345 Diversey Parkway, Chicago, IL 60614
Price: $17.00 (with cassette) Level: 6-9
This filmstrip explains the fundamentals of electrical energy by showing early experiments with electricity and its wide application in a modern industrial society. It illustrates the need for increasing production of electric power to sustain a high standard of living.

ELECTRICITY

Encyclopedia Britannica Education Corporation,
425 N. Michigan Ave., Chicago, IL 60611
Price: $57.50 Level: 4-6
This set of seven filmstrips explains the basic concepts of electricity. Included are heat and light from electric current, insulators and conductors, series and parallel circuits, and the use of electromagnetic phenomenon to produce electricity.

ELECTRICITY & ME and ENERGY CONSERVATION

Spartan Graphics, 288 S. State St., Sparta, MI 49345
Price: $40.00 (both filmstrips) Level: 6-9
These filmstrips cover the generation, transmission, distribution, costs and wise use of electricity. Included is a teacher's guide and activity sheets.

ELECTRICITY AT WORK: A SERIES

Singer Education Division, Society for Visual Education,
1345 Diversey Parkway, Chicago, IL 60614
Price: $78.00 Level: 6-9
These full-color sound filmstrips averaging thirteen minutes illustrate the many uses of electricity. The titles are "Light & Heat From Electricity," "Cool Light From Electricity," "Magnetism From Electricity," "The Telegraph & Telephone," "Induction & Transformers," and "Electrolysis."

ELECTRICITY: CELLS & CIRCUITS

Hubbard, Inc., P. O. Box 105, Northbrook, IL 60062
Price: $175.00 Level: 7-12
This is a series of seven 8mm filmloops. It demonstrates electric cells and circuits.

Filmstrips and 8mm Filmloops

ELECTRICITY IN OUR LIVES

Troll Associates, 320 Rt. 17, Mahwah, NJ 07430
Price: $24.95 Level: 2-8
This 8mm filmloop explores such concepts as electrical flow from power station to homes. It emphasizes the importance of electricity in our daily lives.

ELECTRICITY IS ENERGY

Outdoor Pictures, Box 277, Anacortes, WA 98221
Price: $20.00 (slides) Level: 2-6
$15.00 (filmstrip)
This color-sound filmstrip deals with electricity as energy. It is suitable for background material or as a supplement to introductory science studies.

ELECTRICITY MAKES MAGNETS

Hubbard, Inc., P. O. Box 105, Northbrook, IL 60062
Price: $175.00 Level: 7-12
This series of seven 8mm filmloops shows how electricity makes magnets. Concepts from inductive field to electric motors are shown.

ELEMENTARY SCIENCE SERIES

Colonial Films, 4315 N. E. Expressway Road,
Doraville, GA 30340
Price: $480.00 Level: 1-8
This is a series of 88 filmstrips with 88 teacher's guides. Some subjects included are living matter, air and water, electricity, heat, light, and energy.

ENERGY: A STUDY OF RESOURCES

Q + ED Productions, P. O. Box 1608, Burbank, CA 91505
Price: $110.50 (records) Level: 7-12
$122.50 (cassettes)
This series presents a problem which threatens to change the character of human life on earth within the immediate future. It illustrates a need for a change of lifestyle to conserve our remaining energy reserves.

ENERGY: ABILITY TO DO WORK (A Series)

Aims Instructional Media Inc., 626 Justin Ave.,
Glendale, CA 91201
Price: $130.00 Level: 1-6
This filmstrip series uses a basic approach to energy concepts such as kinetic, sunlight, chemical, human, plant, mechanical, gravitation, electrical, and heat. Each topic is illustrated by example in an inquiry-discovery treatment with a reinforcement mode.

ENERGY & THE EARTH

Lyceum, Inc., Box 1295, La Punte, CA 91749
Price: $46.00 (with cassette) Level: 6-12
This is a two-part color filmstrip. It covers the development of the earth's resources, understanding of basic energy limitations; and renewable and non-renewable energy resources.

ENERGY & YOU: CONSERVING ENERGY

Visual Education Consultants, Inc., P. O. Box 52,
Madison, WI 53701
Price: $7.50 Level: 7-12
This black-and-white filmstrip outlines many ways we can cut down our own consumption of fuel to make our energy supplies stretch further. It describes the "energy crisis".

THE ENERGY CRISIS

Donars Productions, P. O. Box 24, Loveland, CO 80537
Price: $8.00 Level: 5-8
This color-captioned filmstrip discusses the growing need for energy and our dwindling reserves. Possible solutions offered are the use of nuclear energy, wind power, solar energy, and harnessing the tides.

THE ENERGY CRISIS: DEPLETING THE WORLD'S RESOURCES

Current Affairs, 24 Danbury Road, Wilton, CT 06897
Price: $24.00 Level: 7-12
This filmstrip is an in-depth analysis of the effects energy shortages could have on the quest for economic and social progress. The issue of developing new energy sources while protecting our environment is also discussed.

I. MEDIA

B. Books

1. Background Reading Material

ALTERNATIVE SOURCES OF ENERGY

The Seabury Press, 815 Second Ave., New York, NY 10017
Price: $7.95 Level: 6-12
Alternative Sources of Energy is a comprehensive guide which can help anyone cope with the energy crunch. It also deals with food shortages and inflation.

ASK ME A QUESTION ABOUT THE ATOM

Author: S. Rosenfeld
Harvey House, Div. of E. M. Hale & Co.,
20 Waterside Plaza, New York, NY 10010
Price: $4.69 Level: 5-8
This book is suitable as enrichment or supplementary material for discussion or inquiry. It covers basic atomic structure in simple terms.

ATOMIC ENERGY (1970)

Author: M. Gaines
Grosset & Dunlap, Inc., Publishers, 51 Madison Ave.,
New York, NY 10010
Price: $4.49 Level: 8-12
This book outlines the physical principles behind nuclear power. It also describes the peaceful uses of the atom.

ATOMIC ENERGY FOR HUMAN NEEDS (1973)

Author: D. R. Michaelson
Julian Messner Div., Simon & Schuster,
Simon & Schuster Bldg., 1230 Ave. of the Americas,
New York, NY 10020
Price: $7.29 Level: 7-12
This book covers the ways in which atomic energy is being used. Uses in fields such as medicine, industry, and agriculture are documented.

ATOMS & ENERGY (1976)

Author: Ardley
Franklin Watts, Inc., 730 Fifth Ave., New York, NY 10019
Price: $5.90 Level: 5-12
Atoms and Energy explores the efforts to harness the energy of the atom. The topics covered are how atoms join together and break apart, the uses and dangers of radiation, and the nature of nuclear energy.

THE AUTONOMOUS HOUSE: DESIGN AND PLANNING FOR SELF SUFFICIENCY

Authors: Brenda and Robert Vale
Universe Books, 381 Park Avenue South, New York, NY 10016
Price: $10.00 (clothbound)
$ 4.95 (paperback) Level: 12
Two architects offer practical solutions to the building of a house that operates independently within its immediate environment. This book is suitable for individual study or class projects.

CARELESS ATOM (1969)

Author: S. Novick
Houghton-Mifflin Company, Two Park Street, Boston, MA 02107
Price: $5.95 Level: 9-12
Careless Atom is an exploration of the present and potential dangers resulting from nuclear reactors. It is written in nontechnical language.

CONCEPT OF ENERGY SIMPLY EXPLAINED (1964)

Author: M. Mott-Smith
Dover Publications, Inc., 180 Varick St., New York, NY 10014
Price: $2.75 (paperback) Level: 10-12
Energy conservation, entropy, engines, and similar topics are covered with stress on nineteenth and twentieth century developments. This book contains thirty-three illustrations.

THE CONCRETE APPROACH TO ENERGY CONSERVATION

Portland Cement Association, Old Orchard Rd,
Skokie, IL 60076
Price: $2.10 Level: 10-12
This book presents data for analyzing and comparing insulating properties of concrete with other types of construction. It demonstrates the energy-saving advantages of concrete.

CONSIDER THE PROCESS OF LIVING

Author: W. H. Eddy, Jr. et al.
Conservation Foundation, 1717 Massachusets Ave., NW,
Washington, DC 20036
Price: $8.00 Level: 9-12
This background material emphasizes the basic elements that comprise the web of life. It introduces the reader to foundations of plant and animal life: air, water, earth, and energy.

COPING WITH THE OIL CRISIS: FRENCH AND GERMAN EXPERIENCES (1975)

Author: Horst Mendershausen
Johns Hopkins University Press, Baltimore, MD 21218
Price: $2.95 (paperback)
$7.50 (hardcover) Level: 12
This book explains and compares the roles of France and The Federal Republic of Germany in the traditional pattern of world-wide oil relations. It describes how this pattern has changed.

COUNTDOWN TO A NUCLEAR MORATORIUM

Environmental Action Foundation, Dupont Circle Building,
Suite 724, Washington, DC 20036
Price: $3.00 Level: 10-12
This series of articles presents an overview of the safety and economic arguments against nuclear power. It also analyzes the potentials for energy conservation and renewable resources.

Background Reading Material

DAMMING THE WEST: THE REPORT ON THE BUREAU OF RECLAMATION

Authors: Berkman and Viscusi
Penguin Books, 299 Murray Hill Parkway,
East Rutherford, NJ 07073
Price: $2.50 Level: 11-12
This book is part of the Nader Study Group Reports. It deals with damming of western rivers and is suitable for use in social studies or environmental education classes as a basis for discussion or individual study and research.

DAMMING OF SOLAR CELLS

Author: D. Morris
Institute for Local Self-Reliance, 1717 18th Street NW,
Washington, DC 20009
Price $2.00 Level: 9-12
This book is a guide to the potential for generating electricity from solar energy. It serves as a basic introduction to the technology and economics of solar cells.

DIRECT USE OF THE SUN'S ENERGY

Author: F. Daniels
Ballantine Books, A Division of Random House, Inc.,
201 East 50th Street, New York, NY 10022
Price: $1.95 Level: 6-12
This book is an overview of solar energy with emphasis on global applications. It contains basic information in a nontechnical form.

THE EARLY PETROLEUM INDUSTRY

Author: Paul H. Giddens
Porcupine Press, 1317 Filbert St., Philadelphia, PA 19107
Price: $17.50 Level: 10-12
A two-part volume, this publication deals first with the early history of the petroleum industry. The second part is a bibliography of materials which covers the early years of the petroleum industry in this country.

EASI-GUIDE TO CONSERVING ENERGY AND MATERIAL

Author: Forest H. Belt
H. W. Sams & Co., Inc., 4300 W. 62nd St.,
Indianapolis, IN 46268
Price: $3.50 Level: 9-12
This book contains simple tips on conserving energy. It emphasizes coping with energy and material shortages.

ECOLOGICAL FANTASIES; DEATH FROM FALLING WATERMELONS

Author: C. A. Adler
Educational Sales Department, Dell Distributing, Inc.,
1 Dag Hammarskjold Plaza, 245 East 45th Street,
New York, NY 10017
Price: $2.95 Level: 10-12
Adler points out that over 500 recently printed books attempt to scare us with data that time is running out on the world. His book is a refutation of the we-are-killing-our-environment theorists.

ECONOMICS OF ENERGY (1975)

Author: L. E. Grayson
Darwin Press, Inc., Box 2202, Princeton, NJ 08540
Price: $16.95 (hardcopy)
$ 6.95 (paperback) Level: 10-12
This book reviews the economic dimensions of energy supply and demand and shortages. It includes governmental regulations and new technology sources in the U.S. and overseas.

EFFICIENT ELECTRICITY USE: A HANDBOOK FOR AN ENERGY CONSTRAINED WORLD

Pergamon Press, Maxwell House, Fairview Park,
Elmsford, NY 10523
Price: $20.00 Level: 11-12
This book is a complete guide to understanding and coping with energy shortages. It covers industrial, commercial, and residential uses of energy, as well as energy alternatives.

Background Reading Material

ELECTRICITY: THE FACTS & THE FUTURE

Wisconsin Electric Power Co., 231 West Michigan, Milwaukee, WI 53201
Price: Individual copies free
Two or more cost $ .50 each Level: 7-12
This is a consumer guide to the production and use of electricity in Wisconsin. It also contains conservation tips and a discussion of future energy sources.

ELUSIVE BONANZA (1970)

Author: C. Welles
E. P. Dutton, 2 Park Avenue, New York, NY 10016
Price: $7.95 Level: 12
This is the story of problems related to recovering fossil fuel from oil shale in the Western U.S. It combines a business-like approach with adventure.

ENERGY AND ENVIRONMENT

Author: G. O. Robinette
Kendall-Hunt Publ. Co., 2460 Kerper Blvd., Dubuque, IA 52001
Price: $11.40 Level: 10-12
Robinette shows how landscape architecture can work with electric utilities to enhance and preserve the environment. He offers practical solutions to the problems of energy output and environmental preservation.

ENERGY BOOK 1 (1975), ENERGY BOOK 2 (1977)

Author: John Prenis
Running Press, 38 South Nineteenth St., Philadelphia, PA 19103
Price: $4.00 Book 1
$5.00 Book 2 Level: 7-12
These books can be used separately or together. Both are anthologies covering alternate sources of energy written with the layperson in mind.

Background Reading Material

THE ENERGY CONTROVERSY

Author: F. H. Schmidt
Albion Publishing Co., 1736 Stockton St.,
San Francisco, CA 94133
Price: $4.95 Level: 10-12
This book analyzes various problems involved in the use of nuclear power. It is brief and clearly written.

ENERGY, ECOLOGY, ECONOMY

Author: Gerald Garvey
W. W. Norton & Co., Inc., 500 Fifth Ave.,
New York, NY 10036
Price: $3.75 (paperback) Level: 12
In this study Mr. Garvey develops a framework for assessing the long-term destruction caused during the production, transportation, and conversion of fuel to meet our growing demands for energy. It is useful as a basis for discussion or for research or special study.

ENERGY, ECONOMIC GROWTH, & THE ENVIRONMENT (1972)

Editor: Sam H. Schurr
John Hopkins University Press, Baltimore, MD 21218
Price: $12.00 (hardcover) Level: 12
$ 2.95 (softcover)
Authorities with different perspectives consider assuring future energy supplies and protecting the natural environment. The ideas are presented in a nontechnical manner.

ENERGY: DEMAND VERSUS SUPPLY (1975)

Editor: Diana Reische
H. W. Wilson Company, 950 University Avenue,
Bronx, NY 10452
Price: $5.75 Level: 12
This publication is a compilation of newspaper and magazine articles. It deals with the energy shortage, alternative energy sources, national policy, and consumer options.

ENERGY ESSAYS

Editor: Malcolm Wells
Edmund Scientific, Inc., 7778 Edscorp Building,
Barrington, NJ 08007
Price: $5.95 Level: 6-12
This illustrated book explores the possibilities for alternative sources of energy. It includes contributions from many noted authorities in the fields of environmental management and energy theory.

ENERGY FOR SURVIVAL: THE ALTERNATIVE TO EXTINCTION (1974)

Author: W. Clark
Anchor Press, Division of Doubleday & Company,
245 Park Avenue, New York, NY 10017
Price: $4.95 (softbound) Level: 10-12
This book is a survey of energy crisis issues. The emphasis is on the human need for energy to survive and, hence, the necessity of finding new sources of energy.

ENERGY IN THE WORLD OF THE FUTURE

Author: H. Hellman
M. Evans & Co., Inc., 261 E. 49th St., New York, NY 10017
Price: $6.95 Level: 7-12
This book is an examination of present and future energy sources. It is a nontechnical, useable presentation of important ideas.

ENERGY: ITS PAST, ITS PRESENT, ITS FUTURE

Author: Martin J. Gutnik
Children's Press, 1224 West Van Buren Street,
Chicago, IL 60607
Price: $5.50 Level: 4
Energy and the way man has harnessed its power have influenced life since prehistoric times. The book deals with how people will live in the future and concludes that the quality of life will be determined by how energy is conserved and by the discovery and use of new energy sources.

I. MEDIA

B. Books

2. Textbooks

ALASKA & THE ESKIMOS

Allyn & Bacon, Inc., 470 Atlantic Avenue,
Boston, MA 02210
Price: $3.21 (pupil text) Level: 1-3
$3.21 (teacher's guide)
This book is an elementary social science text with a teacher's guide suggesting many learning activities. It includes an introductory study of community organization and the relationship between a community and its environment.

BIOLOGICAL SCIENCE, AN ECOLOGICAL APPROACH (Third Edition)

Rand McNally & Co., P. O. Box 7600, Chicago, IL 60680
Price: $10.89 Level: 9-12
This text emphasizes environmental concerns with laboratory investigations woven in. Inquiry, observation, and experimentation prompt students to adopt a scientific view of the world around them.

CHOICES & DECISIONS: ECONOMICS & SOCIETY

Allyn & Bacon, Inc., 470 Atlantic Avenue,
Boston, MA 02210
Price: $4.86 (student text) Level: 6-8
$3.45 (teacher's guide)
This is one part of a series called The Challenges of Our Times which examines recent and contemporary history, including world and domestic developments. The teacher's guide has suggested activities.

COAL: ENERGY & CRISIS

Author: L. D. Chaffin
Harvey House, Division of E. M. Hale & Company,
20 Waterside Plaza, New York, NY 10010
Price: $3.99 Level: 3-5
This is an introduction to the role of coal in the current energy crisis. It is designed to facilitate inquiry and discussion.

ENERGY: A PHYSICAL SCIENCE

Editor: P. E. Brandwein
Harcourt, Brace, Jovanovich, Inc., 757 Third Avenue,
New York, NY 10017
Price: $8.70 Level: 8-10
This text considers the major forms of energy individually. The metric system is used throughout and stress is on the development of laboratory investigations and the interpretation of data from these investigations.

ENERGY & ECOLOGY (1975)

The Reading Laboratory, Inc., 55 Day Street,
South Norwalk, CT 06854
Price: $ 2.25 (each) Level: 5-9
$49.50 (set of 25)
Energy and Ecology utilizes ten specially edited news service articles which explore selected facets of our energy-ecology crisis. Special exercises are included that develop reading comprehension, critical reading skills, and vocabulary.

ENERGY & INERTIA

Author: H. Hellman
M. Evans & Co., Inc., 216 E. 49th St., New York, NY 10017
Price: $3.95 Level: 2-5
Questions regarding energy forms are clarified in this text. The law of inertia is explained in terms of everyday activities.

ENERGY & THE FUTURE

Authors: Allen Hammond, William Metz, Thomas Maugh II
AAAS Publication Sales, Dept. Q, 1515 Massachusetts Ave. NW,
Washington, DC 20005
Price: $9.95 (hardcover) Level: 11-12
$4.95 (paperback)
This book surveys the scientific and technological basis of the energy dilemma. It discusses environmental issues, new energy sources, research priorities, and energy policy.

ENERGY CRISIS/1969-77 (3 Volumes)

Facts on File, 119 W. 57th Street, New York, NY 10019
Price: $31.95 (three-volume set) Level: 11-12
$11.95 (Volume 1)
$10.95 (Volume 2)
$11.95 (Volume 3)

This is a survey of the development of the energy crisis. Included are historical perspectives, federal proposals, and descriptions of research on alternate power sources.

ENERGY CRISIS: DANGER & OPPORTUNITY (1974)

West Publishing Company, 50 W. Kellogg Boulevard, P. O. Box 3526, St. Paul, MN 55165
Price: $13.95 Level: 11-12

In this text, danger and opportunity are discussed in relation to the energy crisis. Ten of the nation's energy experts cover areas vital to an understanding of the energy crisis and its ramifications.

ENERGY FROM SOURCE TO USE (1975)

Editor: Howard S. Stoker
Scott, Foresman & Company, 11310 Gemini Lane, Dallas, TX 75229
Price: $5.95 Level: 11-12

Dealing with the nature of energy and its sources, this text brings together extensive scientific data to provide an account of current and anticipated energy problems. With this data, the contributors explore all current and potential sources of energy, and discuss the origins, reserves, and problems related to their conversion and use.

ENERGY, ORGANIZATION & LIFE (1967)

Author: R. R. Panares
Educational Methods, 500 N. Dearborn Street, Chicago, IL 60610
Price: $3.75 Level: 10-12

This textbook explores the physical and chemical basis of living systems. It also reviews the need for energy and then investigates the processes of photosynthesis and respiration that make energy available to living things.

EXPLORING & UNDERSTANDING SERIES: MATTER & ENERGY

Benefic Press, 10300 W. Roosevelt Road,
Westchester, IL 60153
Price: $3.45 Level: 4-9
This is a series of five books which deal with machines, light, heat, magnetism, and chemistry. The emphasis is on helping students develop skill in scientific inquiry.

FOCUS ON EARTH SCIENCE

Author: M. Bishop
Merrill Publishing Company, 1300 Alum Creek Drive,
Columbus, OH 43216
Price: $8.40 Level: 7-9
This text is on earth science with chapters on energy-related areas. Included are discussions of mineral fuels, the environment, and the circulation of ocean water.

FOCUS ON PHYSICAL SCIENCE

Author: C. E. Heimler
Merrill Publishing Company, 1300 Alum Creek Drive,
Columbus, OH 43216
Price: $8.40 Level: 7-9
This is a textbook on physical science. Energy-related chapters are on heat, electricity, radiation, nuclear reactions, and energy technology.

A FOREST-PRODUCTS COMMUNITY: CROSSETT, ARKANSAS

Allyn & Bacon, Inc., 470 Atlantic Avenue,
Boston, MA 02210
Price: $2.16 (pupil text) Level: 1-3
$6.60 (teacher's guide)
This text is part of an elementary social science series which focuses on basic community economic-social interrelationships. The teacher's guide includes suggested activities and covers the entire series.

THE HEAT'S ON

Author: B. M. Siegel
Prentice-Hall, Inc., Children's Book Dept.,
Englewood Cliffs, NJ 07632
Price: $4.50 Level: 3-7
The Heat's On covers basic concepts of heat and temperature. It is geared to motivate readers to make investigations on their own.

INDUSTRY: PEOPLE & THE MACHINE

Allyn & Bacon, Inc., 470 Atlantic Avenue,
Boston, MA 02210
Price: $3.90 (student text) Level: 3-5
$3.90 (teacher's guide)
This elementary social science text explores roles of specialization, research, and capital investment in the creation of a mass-production, mass-consumption society. The teacher's guide contains suggested activities.

INVESTIGATING THE EARTH (1976)

Houghton-Mifflin Company, Two Park Street,
Boston, MA 02107
Price: $13.76 Level: 9-12
Investigating the Earth is concerned with our knowledge of the earth and its environment. Laboratory experiences are integrated into the text and are designed to be inquiry oriented.

JUNIOR SCIENCE BOOK OF HEAT (1964)

Author: Rocco V. Feravolo
Garrard Publishing Company, Editorial Offices,
107 Cherry Street, New Canaan, CT 06840
Price: $3.96 Level: 2-5
This basic primer of heat gives pertinent facts about the subject. The information is reinforced with easy-to-do experiments and illustrations.

LANDS OF THE MIDDLE EAST

Allyn & Bacon, Inc., 470 Atlantic Avenue,
Boston, MA 02210
Price: $4.68 (student text) Level: 4-6
$4.68 (teacher's guide)
This book explores the culture of the Middle East in terms of the significant factors affecting human societies. The teacher's guide includes suggested learning activities.

LET'S FIND OUT ABOUT THE SUN (1975)

Author: Shapp
Franklin Watts, Inc., 730 Fifth Avenue, New York, NY 10019
Price: $4.90 Level: K-3
This is a full-color text with illustrations. It explains the concept of the earth's movement around the sun and the changing seasons.

MOTION

Author: Legunn
Creative Education, 123 S. Broad St., Mankato, MN 56001
Price: $5.95 Level: 5-9
With this book the reader is encouraged to do his own thinking and searching. It contains an activity section completely devoted to problem-solving and experiments.

OUR NATURAL RESOURCES (1976)

Authors: H. B. Kircher and P. E. McNall
The Interstate, Printers and Publishers, Inc.,
19-27 North Jackson Street, Danville, IL 61832
Price: $9.50 (discounts available) Level: 10-12
This textbook teaches the importance of intelligent resource use and the principles of ecology. It focuses on controlling conflicts of interest which have led to environmental abuse.

I. MEDIA

C. Instructional Materials

1. Curriculum Materials

AIR POLLUTION CHEMISTRY: AN EXPERIMENTER'S SOURCEBOOK

Author: H. Bassow
Hayden Book Co., Inc., 50 Essex St.,
Rochelle Park, NJ 07662
Price: $4.95 Level: 10-12
This manual is designed to initiate dicussion and experimentation in air pollution. It includes sections on environmental balances, the beginning of pollution, current pollution problems, and potentials for the future.

CURRICULUM ACTIVITIES GUIDE TO ELECTRICAL POWER GENERATION & THE ENVIRONMENT

Project KARE, McGinnis Office Bldg., Rt. 73 and Butler Pike,
Blue Bell, PA 19422
Price: $5.50 Level: 1-12
This unit contains activities written by teachers dealing with energy and the consumer, energy and water pollution, energy and air pollution. Some activities are appropriate for elementary students, others for secondary students.

CURRICULUM RESOURCES FOR ENVIRONMENTAL PROGRESS (Volumes I and II)

ERIC/SMEAC, 1200 Chambers Rd., Columbus, OH 43212
Price: free Level: 7-12
Volume I contains 225 teaching activities for the study of land use, natural resources allocation and depletion, energy use and conservation, in the fields of fine arts, language arts, science, social studies, and vocational arts. Volume II includes annotations for 5,549 titles that support studies in energy and environmental education.

EARTH SCIENCE CURRICULUM GUIDE

Plano Independent School Dist., 1517 Ave. H, Plano, TX 75074
Price: $6.00 Level: 7-9
This is part of a larger curriculum guide (levels 6-12). It includes an earth science course outline, text, all materials needed, and activity suggestions.

ELECTRICAL PRODUCTION & POLLUTION CONTROL

Topeka Outdoor Environmental Education Ctr.,
1601 Van Buren, Topeka, KS 66612
Price: $2.50 (limit 1 copy) Level: 11-12
This guide investigates commercial production of electricity and methods of controlling resultant pollution. It can be used as a supplement to other energy-environment education materials.

ENERGY & ORDER, OR, IF YOU CAN'T TRUST THE LAW OF CONSERVATION OF ENERGY, WHO CAN YOU TRUST?

Author: M. Terry
Friends of the Earth, 124 Spear, San Francisco, CA 94105
Price: $3.00 Level: 7-12
This is a lesson plan for teaching about energy in the context of a science or civics class. It begins with simple and applicable discussions of entropy, energy uses in the home, city, and industry, and ends with discussions of the social and economic implications of various utility technologies.

ENERGY & YOU

Topeka Outdoor Environmental Education Ctr.,
1601 Van Buren, Topeka, KS 66612
Price: $2.50 Level: special education
This is a simple introduction to the interaction of humans and their energy needs. It can be used as a supplement to any basic skill material.

ENERGY CONSERVATION: GUIDELINES FOR ACTION

Michigan Association of School Administrators,
421 W. Kalamazoo, Lansing, MI 48933
Price: $.75 (quantity discount available) Level: K-12
This manual establishes goals and objectives for energy education. It also provides useful examples of teaching materials and procedures at every grade level.

ENERGY, MATTER, & CHANGE: EXCURSIONS INTO PHYSICAL SCIENCE

Author: R. D. Townsend
Scott, Foresman and Co., 11310 Gemini Lane,
Dallas, TX 75229
Price: $7.98 Level: 7-9
In this guide book, students investigate five major areas of physical science: light, electricity, heat, motion, and chemistry. The program has two major goals: to humanize science for students and to help them arrive at science concepts by experiencing scientific processes.

ENVIRONMENTAL EDUCATION GUIDE, K-12

State Dept. of Education, P. O. Box 6Q,
Richmond, VA 23216
Price: $1.00 Level: K-12
This is a complete environmental education curriculum guide. It is designed to facilitate the understanding of the complexity of interacting forces in our environment.

ENVIRONMENTAL EDUCATION: GUIDES/BOOKLETS

Rosemarie Hammond, Lee County Schools, Environmental Education,
2055 Central Avenue, Fort Myers, FL 33901
Price: Contact source for information. Level: K-12
Lee County Schools offer a wide range of energy-environmental education materials designed on an activity-inquiry basis. All are teacher-developed and can be applied in any discipline; some material is available in Spanish and French.

FINDING OUT ABOUT MAGNETS

Benefic Press, 10300 W. Roosevelt Road,
Westchester, IL 60153
Price: $2.85 Level: K-6
This manual is designed to give elementary students the opportunity to investigate basic facts and concepts about magnets. It contains illustrations and simple experiments.

THE GREEN BOX: HUMANISTIC ENVIRONMENTAL EDUCATION (1975)

Humboldt County Superintendent of Schools, P. O. Box 1408,
Eureka, CA 95501
Price: $40.00 (+ $2.40 tax in Calif.) Level: K-8
The Green Box is a complete K-8 curriculum for conducting a people-oriented program of environmental discovery -- how we affect it and how it affects us. The activities are designed to be integrated into the teaching of any subject area.

INTERACTION SCIENCE CURRICULUM PROJECT (1975)

Rand McNally & Company, P. O. Box 7600, Chicago, IL 60680
Price: $8.43 Level: 7
Through laboratory and field investigations, students become involved in examination of social, economic, and aesthetic consequences of the decisions we make. The manual emphasizes an inquiry approach to the interaction of man and the biosphere.

INTERCOM 77: EXPLORATIONS IN THE EMERGENT PRESENT

Intercom, 281 East 18th Street, New York, NY 10003
Price: $2.50 Level: 8-12
(order under $6.00 must be prepaid)
Intercom 77 is designed to help students identify key global problems and explore their possible impact today and in the near future. It includes learning activities.

INTERCOM 78: TEACHING INTERDEPENDENCE: EXPLORING GLOBAL CHALLENGES THROUGH DATA

Intercom, 218 East 18th Street, New York, NY 10003
Price: $1.75 Level: 8-12
(orders under $6.00 must be prepaid)
Intercom 78 sections work with classroom activities. Students must use data presented in charts, tables, and graphs to examine problems of world interdependence.

INTERCOM 80: AMERICA IN THE WORLD

Intercom, 218 East 18th Street, New York, NY 10003
Price: $1.75 Level: 8-12
(orders under $6.00 must be prepaid)
This unit includes readings, data, fictional accounts, and role-playing activities. It explores America's position relative to other nations in regard to politics, economics, and philosophy.

INTERCOM 82: ENVIRONMENTAL ISSUES & THE QUALITY OF LIFE

Intercom, 218 East 18th Street, New York, NY 10003
Price: $1.75 Level: 8-12
(orders under $6.00 must be prepaid)
Intercom 82 examines the environment through local, national, and global perspectives. It provides multidisciplinary activities for assessing environmental quality, especially in one's own community.

LESS POWER TO THE PEOPLE: ENVIRONMENTAL ENERGY USE

Environmental Action Coalition, 156 Fifth Ave, Suite 1130, New York, NY 10010
Price: $6.50 Level: 4-6
This unit addresses what energy is - why and how we must conserve energy and highlights new sources of energy. The twenty-nine activities and select issues of Eco-News found in the curriculum provide the student with information which is nontechnical and project-oriented.

MATTER & ENERGY IN THE STUDY OF THE EARTH

Griffin-Spalding County School System, P. O. Drawer N, Griffin, GA 30224 (Note: Available only in Georgia)
Price: Free Level: 9
This is a teacher-developed curriculum unit. Its emphasis is on the structure and composition of the earth and its energy.

MINICOURSES: ENERGY IN LIFE (1975)

W. B. Saunders & Co., West Washington Square, Philadelphia, PA 19105
Price: $3.95 Level: 9-10
This introduction to energy permits self-paced instruction with a study guide. It also has tapes on the following topics: the nature of energy, generating and receiving energy, photosynthesis, respiration, utilizing energy, and human energy perceptions.

NATURAL ENERGY WORKBOOK #2

Author: Peter Clark
Visual Purple, P. O. Box 996, Berkeley, CA 94703
Price: $3.95 Level: 10-12
This is a comprehensive guide that is both a construction manual and workbook. It provides short experiments that illustrate the principles involved in building real energy-saving systems.

NUCLEAR POWER: HOW & WHY?

Dept. of Natural Science - DH - 224, San Jose State Univ., San Jose, CA 95192
Price: $2.00 Level: 10-12
This contains suggested topics, activities, and resources for inclusion in a unit on nuclear power plants. It is applicable to physics, chemistry, or physical science.

PHYSICAL SCIENCE: A PROBLEM SOLVING APPROACH

Author: J. L. Carter et al.
Ginn & Company, P. O. Box 20846, Dallas, TX 75220
Price: $9.35 Level: 7-9
This is a unit designed to motivate and instruct average and below average students in physical science. It utilizes a laboratory approach.

POWER: INDUSTRIAL EDUCATION CURRICULUM GUIDE
(Special Education Material for the Handicapped/Disadvantaged)

Omaha Public School, Dept. of Vocational & Adult Education,
Omaha, NE 68131
Price: $2.50 Level: 9-12
This 250-page guide contains topic outlines, objectives, teaching activities, evaluation items, and some student information sheets. It covers energy, mechanical power, fluid power, electrical power, and heat engines.

PROBING THE NATURAL WORLD: CRUSTY PROBLEMS & WHY YOU'RE YOU

Silver Burdett Company, 250 James Street,
Morristown, NJ 07960
Price: $2.31 Level: 9
This is the third level of a three-year intermediate science program. It is self-paced with emphasis on the interrelationship among life, earth, and space science.

PROJECT I-C-E (Instruction-Curriculum-Environment)

Robert J. Warpinski, Director, Project I-C-E,
1927 Main Street, Green Bay, WI 54301
Price: Contact source for information. Level: K-12
Project I-C-E is a K-12 curriculum and instruction program for environmental education designed to lead students to awareness, recognition, and appreciation of the vital issues shaping environmental attitudes and values. The suggested learning activities can easily be integrated into regular courses of study and the program emphasizing the use of the urban and natural community as an extension of and a reinforcement for classroom activities.

SCIENCE CURRICULUM IMPROVEMENT STUDY (1971)

Rand McNally & Company, P. O. Box 7600, Chicago, IL 60680
Price: $3.00 Level: 5-6
SCIS develops the scientific literacy of students at the elementary school level. The units in this series are "Communities", "Energy Sources", and "Models: Electric and Magnetic Interactions".

SUGGESTIONS FOR TEACHING ENERGY CONSERVATION IN HOME ECONOMICS

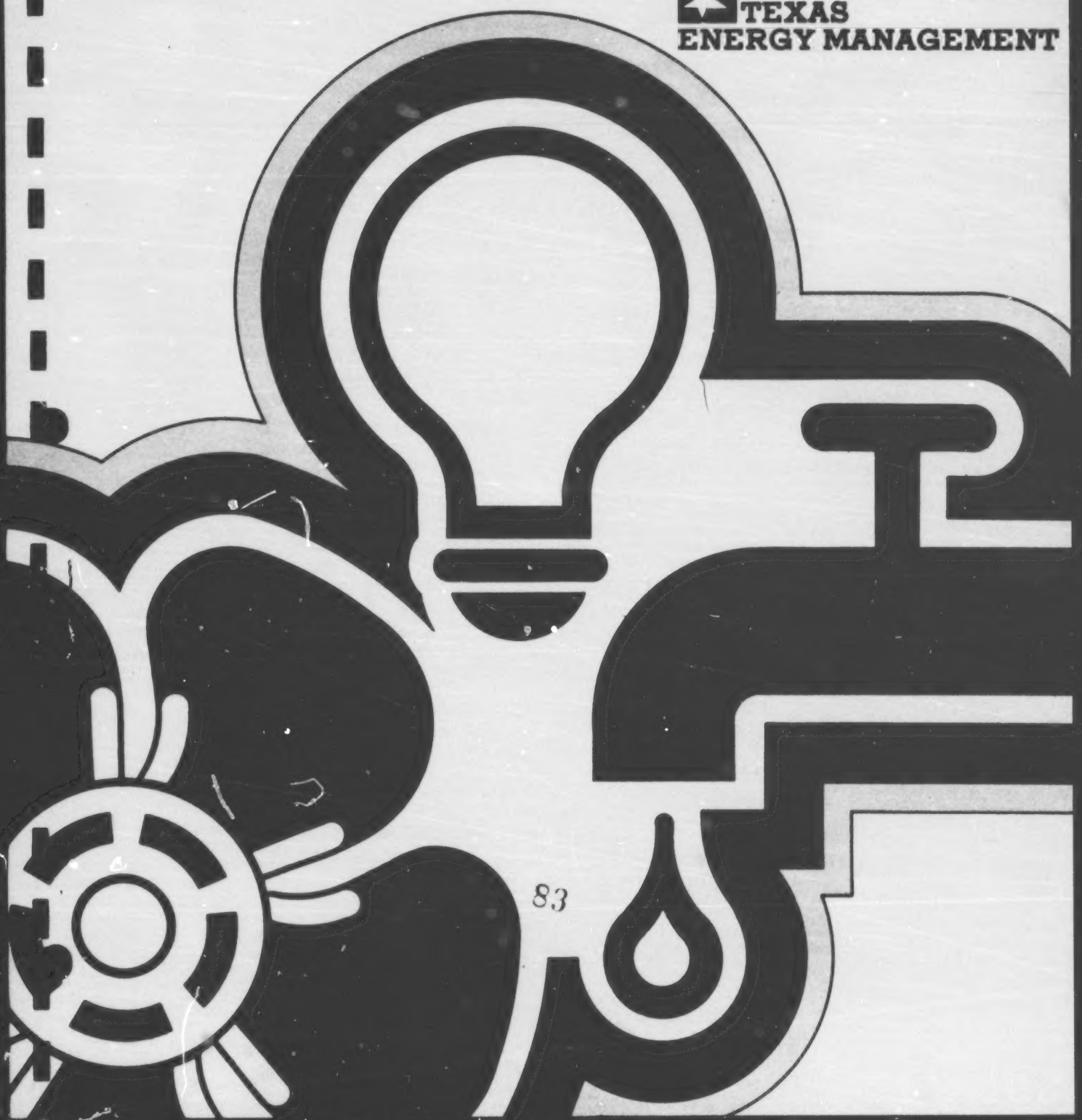
Alabama Dept. of Education, State Office Building,
Montgomery, AL 36130
Price: Free Level: 9-12
This is designed to aid in developing home-use energy conservation curricula. It contains ideas and techniques for classroom teaching and related activities.

ENERGY CONSERVATION GRANTS

Program Training Manual

for Schools, Hospitals, Local Governments and Public Care Institutions

TEXAS
ENERGY MANAGEMENT



FOREWORD

This manual has been prepared by the State of Texas, Governor's Office of Energy Resources, in response to the National Energy Conservation Policy Act, Public Law 95-619 - November 9, 1978. The intent of the instructions and materials contained herein, is to be in full compliance with DOE 10 CFR Part 450,455 Energy Measures and Energy Audits; Technical Assistance and Energy Conservation Measures: Grant Programs for Schools and Hospitals and for Buildings Owned by Units of Local Government and Public Care Institutions.

The staff of the Governor's Office of Energy Resources responsible for overall program coordination of the energy conservation grants program include Duane Keeran for educational institutions, John Carlson for hospitals, and Larry Morgan for local government and public care institutions. Duane Keeran was project director for the development of the Program Training Manual working in coordination with the Office of Facilities Planning and Construction, University of Texas System.

The graphics for the covers were provided by Planergy, Inc.

Technical assistance in the preparation of this manual has been provided by the University of Texas System, Office of Facilities Planning and Construction, which had previously developed a comprehensive energy management plan in compliance with the federal grant program with the assistance of Hammer Consulting Engineers, William E. Wallis & Associates, Love, Freberg & Associates, Lockwood, Andrews and Newnam, Inc., and Goetting & Associates.

ENERGY AUDITORS MANUAL

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ENERGY AUDITOR TRAINING

AGENDA

DAY 1

8:00 - 8:15	Review of Agenda and Procedures
8:15 - 9:30	Presentation of Federal Grants Program and State Implementation
9:30 - 10:00	Review of Data Forms - Energy Cost and Consumption Forms (ECC-1 through 6) Preliminary Energy Audit (PEA-1 through 6) Energy Audit (EA-1 through 4)
10:00 - 10:15	Break
10:15 - 12:00	ECC Forms ECC-1 through 6 Completion: Detailed Review
12:00 - 1:00	Lunch
1:00 - 3:00	PEA Forms 1,2,3 & 4 Completion: Detailed Review Instructions Example
3:00 - 3:15	Break
3:15 - 5:00	PEA Forms 5 & 6 Completion: Detailed Review Purpose Instructions Weighting Factors Identification Example

DAY 2

8:00 - 8:30	Questions from Day 1
8:30 - 10:00	EA Form EA-1: Detailed Review Instructions Major Building System Identification Example
10:00 - 10:15	Break
10:15 - 11:15	EA Form EA-2: Detailed Review Instructions Weather Data M & O Procedures Example
11:15 - 12:00	EA Form EA-3: Detailed Review Instructions M & O Identification Savings Cost Example
12:00 - 1:00	Lunch
1:00 - 2:00	EA Form EA-3 (continued)
2:00 - 3:00	EA Form EA-4: Detailed Review Instructions Retrofit Identification Cost Savings Payback Example
3:00 - 3:15	Break
3:15 - 4:00	Recap. and Questions
4:00 - 5:00	Implementation

STATE IMPLEMENTATION

This section contains a synopsis of the Federal Grants Program and describes the strategy through which the State will assure compliance with these regulations. Of major importance are the implementation schedule and the method of allocating and prioritizing grant funds.

ENERGY CONSERVATION GRANTS PROGRAM FOR SCHOOLS, HOSPITALS, LOCAL GOVERNMENT AND PUBLIC CARE INSTITUTIONS: STATE IMPLEMENTATION

OVERVIEW

Background

The National Energy Conservation Policy Act of 1978, (P.L. 95-619), contains major grants programs to promote energy conservation in four sectors of public and private non-profit buildings constructed prior to April 20, 1977. The Grants Programs for Schools and Hospitals and for Buildings Owned by Units of Local Government and Public Care Institutions (Title III, Parts 1 and 2 of the law) are voluntary activities which provide 50% matching Federal grant funds for programs to be administered by energy offices in each of the 50 states, Puerto Rico, the Virgin Islands, the District of Columbia, Guam and American Samoa.

Program Objectives and Activities

The objectives of the program are to provide financial assistance to the eligible institutions for the energy use analyses of buildings and energy saving measures. In order to assist the institutions in accomplishing these objectives, the grants program has been structured around four steps which comprise the two major phases of these programs.

The first step of Phase I is the Preliminary Energy Audit (PEA). The purpose of the Preliminary Energy Audit (PEA) is to determine the energy savings potential of buildings by identifying the physical and energy-using characteristics of the buildings. The major components of the PEA include major energy using systems identified in terms of fuel source and physical characteristics, prior building energy conservation efforts, renewable energy resource potential, and energy savings potential. The PEA is to provide basic building information which will identify those large energy using buildings and systems which will become candidates for subsequent Energy Audits (EA), Technical Assistance (TA), and Energy Conservation Measures (ECM).

The second step, the Energy Audit, is to provide a survey of the buildings identified as targets by the PEA. The Energy Audit includes reporting the type, size, energy use level and major energy using systems of buildings; maintenance and operating procedures which may be implemented to conserve energy; and data which may identify the need or potential for the acquisition and installation of energy conservation measures.

The first step of Phase 2 is the Technical Assistance (TA) analysis. Technical Assistance consists of a detailed engineering analysis performed by a registered professional; and it includes data relating to specific costs, payback periods, and projected energy savings resulting from the purchase and installation of various energy saving devices or systems. The TA report will include recommendations and analyses for such energy savings measures as storm windows, insulation, solar energy systems, and automatic setback devices to name a few.

The TA is the last step for which local government and public care buildings are eligible.

The final step, Energy Conservation Measures (ECM) provides for the purchase and installation of energy measures including material, equipment, and the physical modification of the building recommended as a result of the TA audit.

Funding

The authorized funding for these programs provides a total of $900 million for schools and hospitals, and $65 million for local government and public care buildings.

In Phase 1, the Department of Energy (DOE) will make grants available to each State to conduct a state-wide program of PEA's in all 4 categories of eligible buildings, and to states or units of local government and public care institutions or both for conducting EA's. In both phases the state will be responsible for the overall planning and administration of the grants.

In Phase 2, grants will be awarded to eligible institutions in accordance with state-wide plans developed by each state energy office and approved by DOE. Grant applications will be submitted annually to DOE through the Governor's Office of Energy Resources which will approve and prioritize them for funding and then forward the applications to DOE for final approval and grant award.

Institutions will be able to use in-kind contributions (such as salaries of personnel and building materials on hand, etc.) to make up all or part of their 50% matching funds. New construction is not included in these grant programs.

Some funding considerations are stated as follows:

- Under the law, schools would receive a minimum of 30% of the state allocation and hospitals also would receive at least 30% of the allocated monies. The remaining 40% would be available to schools and hospitals based upon recommendations of the Governor's Office of Energy Resources.

- No state may receive more than 10% of the total federal funds or less than 0.5%.

- Funds granted to a state or individual facility must be matched 50/50 from non-federal funds.

- Funds may not be used to repay money expended for any energy conservation project commended prior to the effective date of NECPA.

- For schools and hospitals, in cases of severe financial hardship 10% of a state's grant allocation will be reserved to pay up to 90% federal share.

- In accordance with the authorized funding levels for the program under NECPA and the US Department of Energy allocation factors for 1979, it can be estimated that Texas could receive $39,807,975 during the three years of the program. However, full receipt of this funding is contingent upon Congress passing appropriations to match the authorized funding levels. As of the date of publication of this manual, Congress had appropriated $300 million of the total $965 million authorizaton. Actual federal funding for the Texas program during the first of three program cycles is as follows:

1979 (Ending September 30, 1979)

	Phase I PEA/EA	Phase II TA/ECM	Total
Schools & Hospitals	$ 892,824	$7,334,243	$8,227,067
Local Govt & Public Care	334,809	713,051	1,047,860
TOTAL	$1,227,633	$8,047,294	$9,274,927

Because the 1979 allocation to the states is due to lapse after September 30, 1979, the state has established a program schedule which will allow the institutions to apply for the federal grants and have the grants committed by DOE prior to September 30. Refer to the enclosed schedule for timelines of major activities (milestones) for the first program cycle.

Schedules for the second and third year program cycles will be distributed to the eligible institutions at a later date.

PLAN OF ACTION

The following Plan of Action and subsequent sections were developed as part of the program narrative submitted to the U.S. Department of Energy by the Governor's Office of Energy Resources. The Plan of Action is designed to facilitate the submission of institutional applications for Technical Assistance and Energy Conservation Measures by establishing a condensed schedule for Preliminary Energy Audits, Energy Audits, Technical Assistance, and Energy Conservation Measures during the first program cycle which ends on September 30, 1979. The schedule of activities for the second and third years of the program will be more relaxed than the first program cycle as twelve full months will be available for each program cycle during the second and third years of the program.

PEA and EA Forms and Instructions

Preliminary Energy Audit (PEA) and Energy Audit (EA) forms and instructions have been developed which conform to all the requirements of 10 CFR 450.42 and 450.43 published in the Federal Register dated April 2,1979. The PEA form includes two optional pages, 5-6, which will help to identify the energy savings potential of buildings. Although the information is optional, it should be noted that the more information that the Governor's Office of Energy Resources (GOER) receives about energy savings potential, the easier it will be to assess the subsequent applications for Technical Assistance (TA) since GOER is to review and rank TA applications on the basis of energy savings potential. It is likely that pages 5 and 6 of the PEA form will be added to the institutional applications for TA. Pages 5 and 6 of the PEA are especially important for a building which is part of a centrally metered complex.

Both the PEA form and the EA form should be completed for each building which will be the subject of a subsequent TA. Since the EA is a pre-requisite to the TA, the building for which a TA application is submitted must also be the building for which an EA (also PEA, since it is a part of the EA) is submitted. As an example, if an institution conducts a PEA and an EA on a complex of which the TA building is a part, the PEA/EA reports for the complex will not be accepted as meeting the requirements of an EA for that building.

Distribution of Forms

The PEA and EA forms and instructions will be distributed to eligible institutions by means of the Program Training Manual in which they are enclosed. This Manual will be distributed to energy auditors who attend the energy auditor training courses conducted by GOER or its contractors. The PEA and EA forms and instructions may also be obtained by writing to the Governor's Office of Energy Resources, 7703 N. Lamar, Austin, Texas 78752.

Program Training Manual

An Energy Conservation Grants Program Training Manual has been developed which will include all the information which is required for participation in both phases of the program. Among other enclosures, the Manual includes the PEA and EA forms and instructions, supplemental data gathering reports for use in monitoring energy consumption as is required subsequent to installing the Energy

Conservation Measures (ECM), the TA and ECM institutional application forms and copies of the federal rules for Phase I and Phase II.

Energy Auditor Training Program

The Program Training Manual will be distributed to the people who attend the energy auditor training program. The EA training program will be conducted in approximately twenty (20) regions throughout the state between May 9 and May 31, 1979, to facilitate meeting the first program cycle application timelines. Subsequent EA training sessions will be conducted throughout the state in preparation for the second and third year program cycles.

Submission of PEA and EA Forms

In developing the State Plan, tentatively scheduled for June 15, 1979, GOER is required to obtain and analyze a sampling of PEA reports. In assisting GOER to meet this requirement, we are requesting all administrative units of eligible buildings (i.e., school districts, private schools, colleges and universities, hospitals, units of local government and public care institutions) to submit to GOER only three completed PEA reports by May 25, 1979. PEA reports should be submitted for buildings which the administrative unit believes are typical of the construction for each of the three periods: (1) pre-1940, (2) 1940 to 1965, and (3) 1965 to the present. We are also requesting that each administrative unit completes page 2 of the PEA form for all eligible buildings under its jurisdiction limiting data entry to the "Annual Totals" line, the BTU conversion table, the Energy Utilization Index and the Energy Cost Index. This information will assist GOER in meeting its responsibilities for assessing a sample of PEA reports and making projections.

The EA reports (which include the PEA reports) are to be submitted to GOER with the institution's application for Technical Assistance; or if the institution receives an EA grant but chooses not to submit a TA application, the EA report would still be due the same date established for the submission of TA applications.

Energy Audit Grants to Institutions

The federal funding to the Governor's Office of Energy Resources for the first grant cycle ending September 30, 1979, for Phase I totals $892,824 for schools and hospitals and $334,809 for units of local government and public care institutions. Of these amounts, 75% is to be designated for energy audit grants to institutions; thus, $669,618 will be available for grants to schools and hospitals and $251,107 will be available for grants to local governments and public care institutions. Refer to Federal Register dated April 2, 1979, Part 450, Para. 450.46 for grant amounts by building size.

Since the EA grant funding for institutions will be committed by the U.S. Department of Energy (DOE) to GOER prior to September 30, 1979, there will be no problem with this funding lapsing. GOER will have at least twelve months from notice of grant award (approximately May 31, 1979) to award the grants to the institutions.

The Governor's Office of Energy Resources plans to develop an EA grant application for institutions to be made available during the late summer and early fall months of 1979. The ranking of EA grants will be based on criteria which is similar to the severe hardship criteria for TA/ECM identified in 10 CFR 455, Para., 455.71 published in the Federal Register dated April 12, 1979. The rationale for this decision is that since the EA grant funds are so limited, they should be available to institutions which do not have the financial resources to match TA and ECM federal funding but which need to identify no-cost or low-cost maintenance and operating procedures which may help them save energy and related costs.

SCHEDULE OF PROGRAM MILESTONES

MILESTONES	SCHEDULE
Second Calendar Quarter	
1. First year grant cycle begins	April 2
2. PEA and EA forms and instructions developed	April 11-26
3. GOER distributes PEA forms and instructions	April 27-May 11
4. State application to DOE for PEA/EA funding ($1,227,633)	May 1
5. EA training program developed	May 1
6. Energy Conservation Grants Training Manual published	May 7
7. Training program for instructors of energy auditors	May 7-8
8. EA training program is conducted; PEA/EA forms and instructions and TA/ECM applications of institutions are distributed	May 9-31
9. GOER receives PEA forms from institutions for State Plan	May 25
10. GOER analyzes completed PEA forms (reports)	May 25-31
Third Calendar Quarter	
11. GOER submits State Plan to DOE and applies for 2% out of the 5% for TA/ECM administration funding	June 15
12. Deadline for submission of TA/ECM applications to GOER (PEA and EA reports must be submitted with TA application; PEA, EA, and TA reports must be submitted with ECM application)	July 6
13. GOER reviews and ranks institutions' TA/ECM applications	July 6-30

14.	Institutions' TA/ECM applications submitted to DOE by GOER	July 30
15.	DOE notifies institutions of TA/ECM grant awards	Aug. 1-Sept. 30
16.	EA grant applications available to institutions	Aug. 1-Oct. 31
17.	First year grant cycle for PEA/EA ends	Sept. 30

Fourth Calendar Quarter

18.	EA grant applications awarded to institutions	Dec. 14

ADVISING ELIGIBLE INSTITUTIONS OF PROGRAM

Besides having sent letters to all eligible institutions informing them about the program, special effort has been made to distribute information within each of the program areas. Under the State Energy Conservation Plan program, GOER had contracted with each of the twenty regional Education Service Centers to provide information to the public and private primary and secondary schools in the state. GOER has conducted meetings every month since March with the energy coordinators of the Centers. In turn, the energy coordinators have conducted meetings with the schools to disseminate information about the program.

GOER sent letters to the presidents of all the state's 94 public and private college and university campuses on March 15, 1979, inviting them to send representatives to a meeting conducted in Austin on April 27, 1979, involving a comprehensive overview and discussion of the energy conservation grants program. Ninety-seven people attended the meeting indicating considerable interest in the program.

A meeting on the grants program for public and private non-profit hospitals is scheduled in Austin on May 10, 1979. Officials of units of local government have been sent letters about the grants program and the energy auditor training program for units of local government. A presentation in regard to the grants program was made at a meeting of the executive directors of the Texas Councils of Government (COG) on March 9, 1979. GOER also intends to establish a regional program within the state for the dissemination of information about the grants program to units of local government.

Letters will be sent to all eligible institutions informing them about the energy auditor training program to be conducted in twenty regions throughout the state between May 9 and 31.

The amount of federal funding available for each program area has been included in letters and is also included in the Overview of the grants program in the Program Training Manual.

CONSULTATION AND COORDINATION WITH ELIGIBLE INSTITUTIONS

The Governor's Office of Energy Resources established a higher education advisory council in January, 1979 and has conducted monthly meetings to develop program implementation strategy, develop the State Plan, and discuss the elements of the Phase I application to DOE.

As related above, the twenty regional Education Service Center energy coordinators have served as liaison between the schools and GOER and have been involved in the same activities as the higher education advisory council.

The Governor's Office of Energy Resources has established a hospital advisory council consisting of hospital engineers, administrators, architects, and state hospital association officials. A council of representatives of local government and public care institutions is also being planned.

Numerous meetings have been conducted with groups from schools, hospitals, units of local government and public care institutions where important exchange of information has contributed to the development of many aspects of this implementation strategy.

PROGRAM SUPPORT MATERIALS

A Program Training Manual has been developed as the primary document for conducting energy auditor training. Although the Training Manual was initially designed for energy auditor training, the contents were expanded to include the TA and ECM institutional applications, energy consumption monitoring reports, and other resource materials. It is believed that this approach for disseminating materials and information will greatly reduce multiple mailings and provide for a more timely distribution of materials. The contents of the Manual are as follows:

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Energy Conservation Measures/Projects (Examples)
Definitions and Energy Constants
Blank ECC, PEA, EA Forms
TA/ECP Application Forms
Federal Regulations

The Manual includes the EA form which provides for data collection on heating degree days, cooling degree days, insulation, and wind speed for regions within the state. Resource materials to help the institutions identify these data have been included in the Manual.

The Manual will be distributed at the twenty regional energy auditor training sessions to be conducted between May 9 and 31, 1979, as well as subsequent training programs during the duration of the program. Two-thousand manuals will be published by May 7, 1979, with additional printings as required.

ENERGY AUDIT GRANT DISTRIBUTION

As discussed in the Plan of Action, there are many institutions which will not have sufficient matching funds to take advantage of the federal grants program for Technical Assistance and Energy Conservation Measures. Many of these institutions are still interested in doing what they can to save energy and related costs; indeed, it is these institutions that need to save money anywhere they can. The institutions which can afford the 50% match required for Technical Assistance and Energy Conservation Measures will be able to send people to the energy auditor training program or hire consultants to conduct the energy audits. If people are trained to conduct energy audits, then it is questionnable what purpose any EA grant funds would serve except to defray the expenses of the energy auditors who are already under salary of the building owner and who would most likely conduct the energy audits with or without a federal grant.

In order to provide for the equitable distribution of EA grant funds based on need, EA grant ranking criteria will be established consistent with the intent of the grant ranking criteria for severe hardship established in 10 CFR 455, Para. 455.71. These criteria will be sent to DOE along with the appropriate weighting factors after the advisory committees representing the eligible institutions have an opportunity to consider this program and before the EA grant applications are made available to the eligible institutions.

As identified in the federal regulations, the state is required to identify (1) the method by which the EA grant funds will be apportioned between school facilities and hospital facilities, and (2) the method by which the EA grant funds will be apportioned between buildings owned by units of local government and public care institutions. GOER has decided to establish a method of apportionment which would be consistent for the two areas identified above.

In order to provide for an apportionment which would be consistent with the interest expressed in each area by the eligible institutions who submit EA grant applications as well as the federal funding formula for EA grants based on a per gross square foot basis, it has been determined that the amount to be available to schools will be proportioned to the ratio of the total gross square feet of all school applicants to the total gross square feet of all school and hospital applicants. Conversely, the amount to be available to hospitals will be proportional to the ratio of the total gross square feet of all hospital applicants to the total gross square feet of all hospital and school applicants. In like manner, the apportionment of funding for units of local government and public care institutions will be determined.

The pre-requisite for applying for energy audit grants will be the PEA report which would be submitted with the EA grant application. The PEA report includes the gross square feet data which would be used to establish the apportionments.

If the funding for either hospitals or schools exceeds the amount for which each type of institution applies, then the remaining funds shall be made available to the other type of institution. Likewise, if the funding for either units of local government or public care institutions exceeds the amount for which each type applies, then the remaining funds shall be made available to the other type of institution.

REPORTS MADE AVAILABLE TO BUILDING OWNERS AND GOER

Since the PEA and EA audits will be conducted by employees or consultants of building owners, the building owners will be responsible for maintaining files of PEA and EA reports. The institutions will be required to keep at least one copy of the PEA and EA reports on file and send one copy of each report to GOER in accordance with the following section, SAMPLE SURVEY PLANS and the schedule of Milestones. The eligible institutions will be required to submit three (3) copies of the TA application and three (3) copies of the ECM application to GOER. PEA and EA reports must be attached to one copy of the TA application and ECM application if the PEA and EA reports had not already been submitted to GOER. GOER does not expect to conduct PEA or EA in behalf of the eligible institutions.

SAMPLE SURVEY PLANS

Selection of Sample Buildings

Because of the condensed schedule for the first program cycle, it was determined that GOER would attempt to collect a sample of PEA reports which would be representative of the types of construction typical of the three periods: (1) pre-1940, (2) 1940 to 1965, and (3) 1965 to the present. The administrative units over the eligible institutions will be requested to submit one PEA report on each of the three periods which they consider to be most representative of the type of construction of their buildings which were constructed during each period. For example, an independent school district with buildings constructed during each of the three periods would submit three PEA reports. A hospital with only two buildings which were constructed between 1940 and 1965 would submit only one PEA; i.e., one PEA for that period of time.

This sampling procedure should provide GOER with a representative sample of typical construction types in each of the program areas. It is estimated that the sampling technique would result in 1200 PEA reports for primary and secondary education, 240 PEA reports for colleges and universities, 500 PEA reports for hospitals, 1500 PEA reports for units of local government, and 150 PEA reports from public care institutions.

Collect and Validate Building Profile Data

The PEA forms have already been distributed, and the institutions have been requested to return the sample PEA reports to GOER by May 25, 1979. Follow-up letters are being sent out as reminders of the urgency for their timely response. The data will be edited for mathematical correctness, consistency of data, and congruousness. For example, if the primary heat source on page one of the PEA form is indicated to be "direct gas fired" but there are no energy use data on page two for "natural gas," then the editing routine would indicate an error in data entry by the PEA auditor. Such problems as incongruous data, mathematical errors, and inconsistent reporting of the same data requirements would be followed up by telephone inquiries or removed from the sample. Such errors will also have to be corrected by the institution prior to the submission of TA or ECM applications.

Method for Evaluating Maintenance and Operating Procedures

Although there are no federal or state requirements for the identification of operating and maintenance procedures as a part of the PEA report, the identification of operating and maintenance procedures is an important section of the EA report.

The EA report includes a listing of maintenance and operating procedures which the institutions will identify as needed for the building. The institutions will also identify the estimated percentage of energy savings associated with the implementation of the M&O as well as the range of associated cost savings. The institutions are also required to maintain the listing of their scheduled maintenance and operating procedures on file at the institution. These lists will be examined when sample follow-up audits are conducted by GOER in compliance with the requirement to monitor the activities associated with the Energy Audit. The follow-up review by GOER will include an examination of the facility as personnel of the institution explain how the M&O procedures have been implemented.

Assessing Energy Conservation Potential and Costs

The PEA form includes an optional section which will provide an assessment of the energy savings potential of buildings. The Chart of Potential Energy Savings has been adopted from Energy Audit Procedures published by the Ohio Board of Regents, June 1978, with major contributions by Mr. Dallas Sullivan of the Ohio State University. The thirteen different weighting factor entries on energy use systems will be particularly important for buildings which are not metered.

Although the Chart of Potential Energy Savings is optional, institutions have been informed that such data will add strength to their applications for Technical Assistance. However, it is required that this chart be attached to TA application for unmetered buildings. It is likely, however, that this Chart will be included as a requirement of the Technical Assistance application.

Other data on the PEA and EA reports will be analyzed in determining the energy savings potential of the buildings. Such data included the type of major energy using systems, operating schedules, BTU/sq. ft. and cost/sq. ft. Institutions have also been requested to identify any previous energy conservation measures including their costs and savings on the PEA form.

The EA form includes sections for (1) identifying the need and potential for energy conservation retrofit implementation and recommended options, and (2) proposed energy conservation procedures including estimated cost, annual cost savings, and simple payback period in years. The presentation of this data will assist GOER in analyzing the efforts the institutions have made in considering the energy savings potential of their buildings.

PREVIOUS ENERGY AUDITS MEET REQUIREMENTS

The approach of GOER in determining whether or not previously conducted energy audits meet the requirements of the federal regulations is to require those institutions to complete the PEA and EA forms. If energy audits have been previously conducted which meet the requirements, then the institutions should have the data easily available and report it on the PEA and EA forms. As required of other institutions, these institutions must maintain a listing of scheduled maintenance and operating procedures on file.

ENERGY AUDITOR TRAINING AND QUALIFICATIONS

Auditor Training

As reviewed in the Plan of Action, a Program Training Manual has been developed for use in the energy auditor training program as well as being available as a resource concerning both Phase I and Phase II. Energy auditor training programs for all program areas will be conducted in twenty geographical regions of the state between May 9 and 31 in order to allow the institutions to have enough lead time to conduct energy audits and submit Technical Assistance Applications by July 6, 1979.

Auditor Qualifications

The instructors of energy auditor training will be engineers or architects who have had experience in conducting energy audits. There are no minimum qualifications for energy auditors who attend the energy auditor training program except that they must identify the building owner to whom they are providing the service. Federal regulations require no minimum qualifications, although the energy auditor cannot be responsible for the day-to-day operations of the building.

The Energy Audit form includes a certification statement to be signed by the energy auditor which includes the identification of the following: (1) name of auditor, (2) address of training site, (3) sponsoring agency-instructor, (4) date of training; or in lieu of training possess appropriate skills and experience in analyzing and/or operating the mechanical and electrical and other energy using systems of the type of building or complex being audited. Copies of official educational transcripts and/or resumes of appropriate work experience are to be attached to the EA report if the auditor had not attended the GOER training program. The only minimum educational and experience requirements for auditors who have not participated in the training program are the auditor must document some appropriate training and/or experience.

AUDITOR DISCLOSURE OF FINANCIAL INTERESTS

The energy auditor certification statement on the EA report also includes a disclosure of any financial interest. The statement reads as follows: "I further certify that I am not responsible for the day-to-day operations of the building and that a full disclosure of any financial interest which I might have relating to this energy audit or any energy conservation measure is attached hereto." The auditor is also required to identify his organization of employment.

CERTIFICATION AUDITS MEET REQUIREMENTS

The energy auditor certification statement also includes an acknowledgement that the energy audit was conducted in compliance with the federal regulations. The statement reads: "I also certify that the energy audit was conducted in accordance with the requirements set forth under 10 CFR, Part 450, Paragraph 450.43 of the regulation which was published in the Federal Register dated April 2, 1979.

OWNERSHIP AND CATEGORIES OF ELIGIBLE BUILDINGS

The owners of eligible buildings are to identify themselves on the PEA and EA reports according to the four program areas of (1) schools, (2) hospitals, (3) local governments, and (4) public care institutions. The owners are also required to indicate whether they are (1) public, (2) private non-profit, or (3) an Indian tribe. The major categories of building use are to be identified as follows:

School:	Hospital:	Local Government:
Elementary	General	Office
Secondary	Tuberculosis	Storage
College	"Other" (specify)	Service
University		Library
Vocational		Police Station
LEA Admin.		Fire Station
"Other" (specify)		"Other" (specify)

Public Care Institution:

Nursing Home
Long-Term Care (other than nursing home)
Rehabilitation Facility
Public Health Center
Residential Child Care Center
"Other" (specify)

If the building or complex is "other," enter a one or two word description. For example, if a hospital is neither a general hospital nor a tuberculosis hospital, you would write "other" and add "psychiatric," "obstetrics and gynecology," "eye, ear, nose, and throat," "rehabilitation," "orthopedic," "chronic disease," or other appropriate brief description.

Since the program is voluntary, the building owners of the four program areas will be responsible for identifying their buildings through the submission of PEA and EA reports. In addition, GOER will attempt to collect listings of eligible buildings from state and local facilities agencies including building profile data which may be used to verify data submitted on the PEA and EA reports. Complete listings of all eligible buildings will be prepared and maintained in GOER files.

PARTICIPATION OF INDIAN TRIBE UNITS

There are only four Indian tribe units residing in Texas including the Tiguas, Alabamas, Coushattas, and Kikapoo. The Alabama-Coushattas reservation is located in East Texas near Livingston, the Tiguas reservation is located near El Paso, and the Kikapoo Indians are located near Eagle Pass. The Texas Indian Commission was established to aid the reservations in becoming self-sufficient and improving the health, educational, agricultural, business, and industrial capabilities of the people. The Texas Indian Commission is being contacted about the energy conservation grants program and encouraged to participate.

STATE'S MONITORING OF ENERGY AUDITS

As suggested in 10 CFR, Part 450, GOER will participate in the performance of on-site energy audits and conduct follow-up visits in a sample of between one percent and five percent. The purpose of energy audit monitoring will be to assess the values and problems of conducting energy audits as well as determining if the audits are being conducted in accordance with federal regulations.

A sample of institutions which have submitted PEA reports to GOER will be selected and contacted about the time and location of the energy audits. GOER staff or consultants will then participate in the on-site audit. Appointments will also be made with energy auditors, building operators and administrators to review the EA reports and maintenance and operating procedures identified as a result of the energy audit. Emphasis will be placed on the degree to which the maintenance and operating procedures have been implemented as is required by the federal requirements for state Phase I applications.

OTHER STATE APPLICATION REQUIREMENTS (10 CFR, Part 455, Para. 455.15)

Institutions Conducting Own Energy Audits

In accordance with 10 CFR, Part 455, Para. 455.15 (C1, D1), the state is required to describe procedures for providing funding or services to those schools and hospitals which were willing and able to conduct their own energy audits. In compliance with federal regulations, institutions are to be ranked on the potential energy savings of the buildings as a basis for awarding TA grants. Those institutions which have conducted energy audits with their own resources will be favored in the awarding of TA grants in the event that the grant ranking criteria is the same as other TA grant applications.

Consistency with State Facilities Plans

In accordance with 10 CFR, Part 455, Para. 455.15 (C4), the state is required to explain the manner in which activities shall be consistent with (1) related state programs for educational facilities and (2) state health plans. The Governor's Office of Energy Resources plans to continue communications with the appropriate agencies to ensure that its activities are consistent with state facilities plans. The state application, especially Part IV, and other appropriate materials will be shared with these agencies.

PRINCIPAL GOER PROGRAM STAFF

The following GOER staff are responsible for the program areas as indicated:

Duane Keeran	Educational Institutions
John Carlson	Hospitals
Larry Morgan	Local Governments and Public Care Institutions

ENERGY CONSERVATION GRANTS PROGRAM

MAJOR PROCEDURES AND ACTIVITIES

This section contains a chronological "fact-sheet" which lists the major points and requirements of the Federal and State Energy Plans.

ENERGY CONSERVATION GRANTS PROGRAM

MAJOR PROCEDURES AND ACTIVITIES*

Phase I: Preliminary Energy Audits (PEA) and Energy Audits (EA)

1. First year of the program begins date of publication of Phase I rules in Federal Register, April 2.

2. State application for PEA/EA funds due within 30 days of Phase I rules (May 2).

3. First grant cycle for PEA/EA ends Sept. 30, 1979 (DOE must award notice of grant - State has one year from notice to use funds.)

4. Eligible buildings (1) must be owned by schools, hospitals, units of local government, and public care institutions; (2) must be heated or cooled and not leased (unless there is documentation of intent to purchase); (3) and constructed on or before April 20, 1977 as identified by date of occupancy permit.

5. Since TA and ECM will be awarded on a building-by-building basis, the PEA and EA must be on a building-by-building basis if the institution plans to submit a TA application. If no TA application is planned, the PEA and EA may be for a complex. TA review will include PEA and EA data.

6. The first priority for selection of energy auditors should be personnel of the building owner, but not the day-to-day building operator. However, building operator may participate in the EA under supervision of the energy auditor.

7. There must be a financial interest disclosure by the energy auditor.

8. A copy of the PEA and EA must be maintained by the building owner; and one copy of the PEA is to be submitted to GOER by May 25, 1979 for each of three building construction periods: (1) pre-1940, (2) 1940 to 1965, and (3) 1965 to present. One copy of the PEA and EA must be submitted with the TA application unless already submitted to GOER.

9. The initiation of maintenance and operating procedures recommended in the Energy Audit is a pre-requisite to submitting a Technical Assistance application.

10. Energy Audit grant applications for institutions will be available between August 1 and October 31. The EA grants will be awarded by December 14, 1979.

*This listing of procedures and activities is intended to give the reader an indication of the major procedures and activities. Clarification and additional information are included in the federal regulations and state implementation description.

11. Administrative buildings are not eligible with the exception of local education agencies.

12. If it can be shown on the EA report that there have been energy savings of 20% or more between a base year in the past and a subsequent year as long as there is less than a 10% degree day variance between the two years, then an on-site energy audit is not required. Otherwise, an on-site energy audit is a requirement.

13. Major components of the PEA include building size, operating schedule, major energy using systems, energy use and cost by month, past energy conservation activies, renewable energy resource potential, and building energy saving potential.

14. The components of the EA include energy auditor certification, descriptive building data including major fuel systems by type, climatic and roof characteristics, maintenance and operating procedures, prior energy savings, and simple retrofit recommendations and assessment. The EA shall include any on-site audit.

15. Energy auditor training will be conducted in twenty (20) regions throughout the State between May 9 and May 31 and possibly the first week of June for the first program cycle. Subsequent EA training will also be conducted. GOER will be providing this training and does not now plan to certify large numbers of energy auditor trainers. Notice of EA training programs will be sent to all eligible institutions.

16. Energy auditors must attend the GOER energy auditor training program or document appropriate skills and experience by attaching educational transcripts and resumes of applicable work experience relating to knowledge of building mechanical, electrical, and energy use systems.

17. GOER will conduct follow-up reviews of Energy Audits conducted at institutions as required by federal regulations.

Phase II: Technical Assistance (TA) and Energy Conservation Measures (ECM)

1. Technical Assistance is a detailed engineering energy analysis of the building resulting in a final report with recommendations for maintenance and operating procedures and energy conservation measures. Energy Conservation Measures involve the installation of materials and equipment and the physical modification of the building to save energy.

2. For both TA and ECM, buildings must be owned by schools, hospitals, units of local government, and public care institutions.

3. Eligibility for TA requires that an Energy Audit must have been conducted (the EA includes the PEA) and the recommended maintenance and operating procedures initiated (implemented) or must justify reasons for not implementing the M&O, and submit an application in accordance with federal regulations and the State Plan (submitted to DOE around June 15, 1979).

4. In accordance with federal regulations, a qualified Technical Assistance Analyst must be a registered professional engineer certified by the state or an architect-engineer team with chief members licensed by the state. Although the State Plan may include alternative qualifications, the federal requirements will be used as a reasonable guide. The analyst must also have had appropriate training and experience in energy systems of buildings.

5. The Technical Assistance analyst can have no financial interst in supplying materials and equipment for ECM. However, he/she may be involved in the design and supervision of the ECM.

6. Eligibility for ECM requires that a Technical Assistance must have been conducted or its equivalent according to State Plan, and the recommended maintenance and operating procedures of the EA and TA report initiated (implemented) or must justify reasons for not implementing the M&O, and submit an application in accordance with federal regulations and the State Plan. The ECM must have a simple payback period of not less than 1 year nor greater than 15 years, and the estimated useful life of the measure must be greater than its simple payback period.

7. The TA report shall be used for assessing the ECM application.

8. There are no cost limits on the amount of the TA or ECM.

9. The amount of federal funding for TA and ECM will be an amount up to 50%. The institution must provide the balance of the project cost.

10. The deadline for submission of TA and ECM applications for the first grant program cycle is July 6, 1979. Institutions will be notified of application deadlines for the second and third years of the program.

11. One copy of the TA report, TA application, and ECM application should be maintained by the building owner. Three copies of the TA application and ECM application should be submitted to GOER along with one copy of the TA report.

12. Technical Assistance applications will be ranked on the basis of the potential for saving energy. If the building is not individually metered, the Chart of Potential Energy Savings on pages 5 and 6 of the Preliminary Energy Audit must be submitted with the TA application.

13. TA expense (not claimed as match for TA grant) incurred on or after November 9, 1978 may count as in-kind match for ECM upon approval of the Secretary.

14. Only one TA grant and one ECM grant will be provided for any given building.

15. Although the State Plan is due by August 17, 1979, the State will try to submit the Plan to US Department of Energy (DOE) by June 15, 1979.

16. The State shall assign weighting factors to the three grant ranking criteria established by DOE for ECM including (1) simple payback period of less than 15 years and more than 1 year, (2) conversion to renewable resources and then coal, and (3) the type of fuel saved with priority to oil, then gas and others. The State may add additional factors.

17. The institutional applications for TA and ECM shall be submitted to the Governor's Office of Energy Resources according to federal regulations and the State Plan. Among other requirements, the applications shall include a budget of federal and non-federal funds including in-kind match, a project description with milestones, and justification for severe hardship if claimed. The TA application shall also include the results of the PEA and EA. The ECM application shall also include the EA report, TA report, and projected payback period for the ECM.

18. The institutions shall keep records and reports including a report submitted each January and July on the progress and financial status of the project; final report on TA and ECM submitted within 90 days of project completion - the TA final report shall include the TA analyst report and plan for implementing M&O procedures and acquiring and installing ECM, the ECM final report shall include list of ECM acquired and installed with final projected payback period and statement that the ECM conforms with the TA report and ECM application; and annual reports for three years or for the life of the program, whichever is shorter. All the above records are to be maintained by the building owner for three years.

SUPPLEMENTAL AUDITOR INSTRUCTIONS

The purpose of this section is to provide additional clarification, in some cases through example, to assist the auditor in interpreting the scope of some of the more involved data entries on the PEA and EA Forms.

SUPPLEMENTAL AUDITOR INSTRUCTIONS

The purpose of the following instructions is to supplement the "Procedures" which accompany each page of PEA and EA forms and to clarify specific points outlined in the Federal Regulations.

A. Complex Audits Versus Building Audits

Paragraph 450.41 of D.O.E. Energy Measures and Energy Audits Grant Programs for Schools and Hospitals and Buildings Owned by Units of Local Government and Public Care Institutions, Federal Register, Volume 44, No. 64, Monday, April 2, 1979, defines a "complex" as a closely situated group of buildings on a contiguous site or a closely situated group of buildings served by a central plant, such as a college campus or a multi-building hospital. If an eligible institution wishes ultimately to apply for Federal cost-sharing funds for one or more ECM's which are each applicable to **all** buildings in the complex, then the PEA and EA should be conducted on the complex as a single unit. The TA grant application would be based on the apparent potential of the specified ECM's if implemented complex-wide. An example might be the replacement of all existing lighting with high-efficiency lamps in all buildings in the complex. If the eligible institution wished to consider a particular building in that complex in more detail, then a PEA and EA would have to be completed for that individual building.

B. Preliminary Energy Audit

PEA-1

(d) The choices of "school", "hospital", "local government", or "public care institution" are the only acceptable entries. If the building or complex cannot be categorized in one of these four areas, it is not eligible under this program.

PEA-2

Complete all monthly entries for which metered data is available. If an energy source is used but not metered, enter "N.D.A." in the monthly blanks and make an estimate of the total annual energy use for entry in the "Annual Totals" line. A comparison of the total annual energy use in similar buildings in the same geographic location is the suggested way to estimate this statistic. If metered data on similar buildings is not readily available, an alternate approach is to apportion central meter readings to each building on a square footage and hours of operation basis. You may round the BTU products in the BTU conversion table at the bottom of the page to the nearest million if the entries or products will not be accepted by your calculator.

PEA-4

2. The building height should be the number of stories of that portion of the building with the largest roof area.

3. If the land is not the property of the owner, or if he indicated that the property is not "available space", then check "No".

Optional Forms PEA-5 and PEA-6

These forms are provided as a means of assisting the eligible institutions to assess the energy conservation potential of a given building based on building and HVAC system characteristics. This approach is especially useful when buildings are unmetered.

2.0 Divide the total number of hours in each day that a building is occupied by the total number of hours in each day that the HVAC is turned on.

3.0 Add the nameplate capacities in BTUH from the heating system components (boilers, furnaces, etc.) and the total tonnage of the air conditioning system (convert tons to BTUH by multiplying by 12,000) and express sum as millions of BTUH.

4.2 Large infiltration would result from poorly caulked windows and doors without weatherstripping or tight seals.

4.3 If the building lighting levels are high enough to cause glare, or if large areas of the building are lighted to the same areas as work areas, then circle 6.3. If lighting is "poor" and might be considered marginal for reading purposes, circle 3.5.

4.4, 4.5, 4.6 This information would have to be obtained from the building plans or from the building operator.

4.8 Hospitals, kitchens and laundries would be considered as having a high percentage process load. Most laboratories, dormitories, and shops would be considered as having an average percentage process load. Examples of low percentage process loads would be administrative and classroom buildings.

4.9 Heat recovery may be economically feasible for large buildings using high percentages of outside air. Large process loads can increase the feasibility of heat recovery in that the air exhausted from the building is usually considerably hotter than the fresh air being brought into the building.

Summary: If the sum of the weighting is near 90, the building has high potential for energy conservation. A sum of 75 would indicate that the building probably does not have energy consumption potential. These numbers can be used by the eligible institution to decide whether an EA should be done on that building. NOTE: It is required that Pages 5 and 6 be completed for unmetered buildings, since that information will be helpful when completing the Energy Audit and in assessing Technical Assistance applications.

C. Energy Audit

EA 1

(g) Of special interest are changes which will effect the demands on the HVAC system.

(o)(p) If natural gas is used for generating chilled water, electricity is probably being consumed to operated fans and pumps.

(t)(u)(v)(w) If the building is served by a central plant, the source of fuel used by the plant is NOT entered in this table.

(x) You may round the BTU products in the BTU conversion table to the nearest million if the entries or products will not be accepted by your calculator.

(y) The conditions in question are those which effect energy consumption.

(l) Through(v) Unless major systems have individual meters, the information required on this part will have to be estimated by the auditor. If heating is by natural gas, and cooling and lighting are electrical, then the problem is one of proportioning the KWH between lighting and cooling. Two approaches are possible:

(1) Estimate the total lighting (watts per square foot) and multiply by the building area and the total number of hours each year that the lights are on. The product is an estimate of the lighting load, and the remainder can be converted to BTU's and added to the gas consumption to estimate the HVAC load.

If the building is a laundry or kitchen and the process load is significant, the auditor will have to estimate the process and lighting loads and the remaining consumption can be attributed to HVAC.

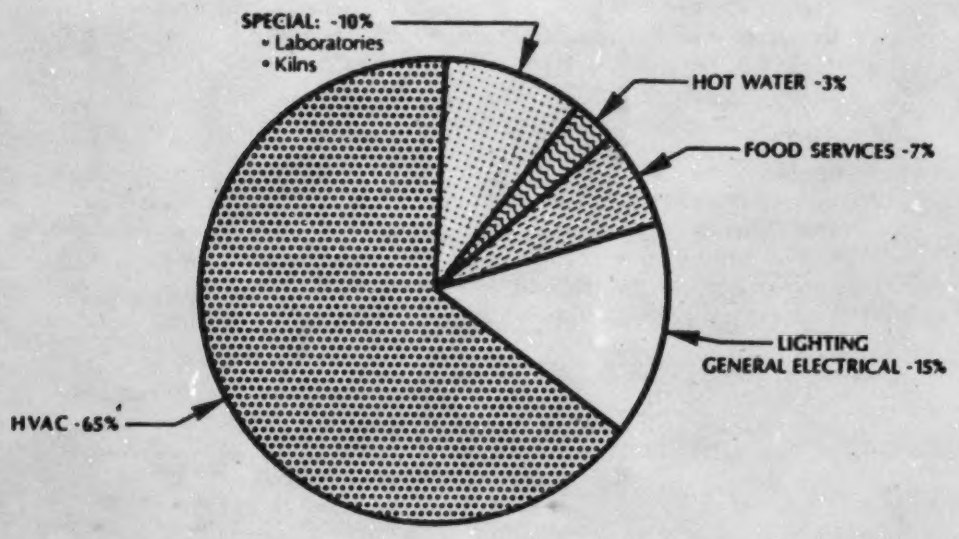
If the building is part of a complex which has central metering, then the total annual estimated load (ggg) on PEA-2 must be proportioned among the major energy users.

The following energy use figures are presented as general guidelines to assist the auditor in identifying the amount of energy consumption by major energy using systems.

EDUCATIONAL INSTITUTIONS

In 1977, the nation's educational institutions consumed 1.1 quadrillion BTU's or approximately 1.5% of the total U. S. consumption of energy of all forms. As energy costs continue to erode educational budgets, the importance of a comprehensive energy management program for educational institutions becomes obvious.

As can be seen from the figure below, energy is utilized in a number of ways. Although these percentages will vary, the heating, ventilating, and air conditioning systems (HVAC) usually represent the greatest single usage. Lighting and general electrical represent the second major category.



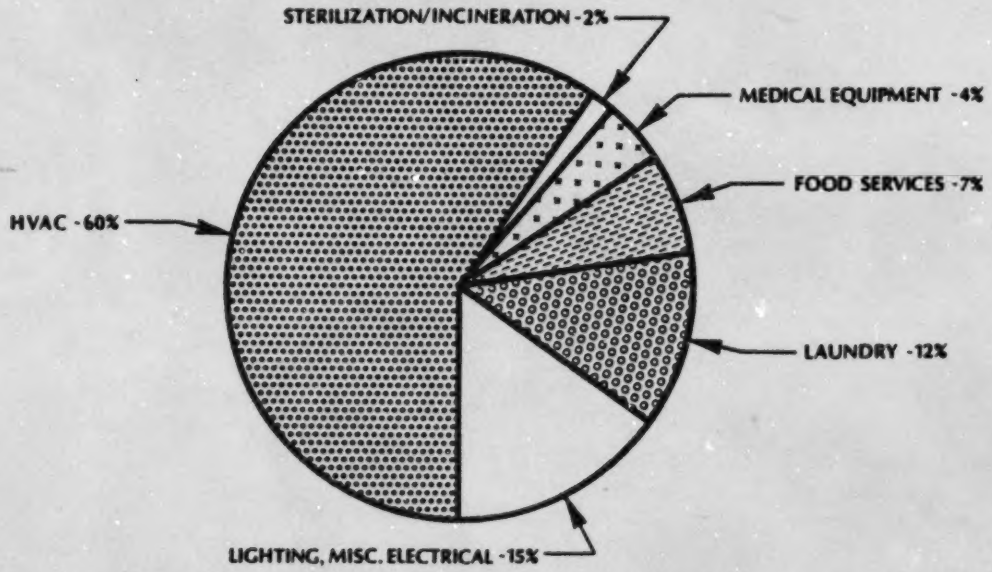
MAJOR ENERGY END USES IN A TYPICAL U.S. EDUCATIONAL INSTITUTION

(Adapted from Energy Audit Workbook for Educational Institutions, Fuel & Energy Consultants, Inc., 1978, Page 2)

HOSPITALS

Nearly 90% of all U. S. hospitals were designed and constructed before 1974 when the importance of effective energy management was beginning to surface.

Environmental control (heating, ventilating and air conditioning) requires the greatest share of all energy used in a typical hospital; lighting and wall receptacles often represent the second highest end use.

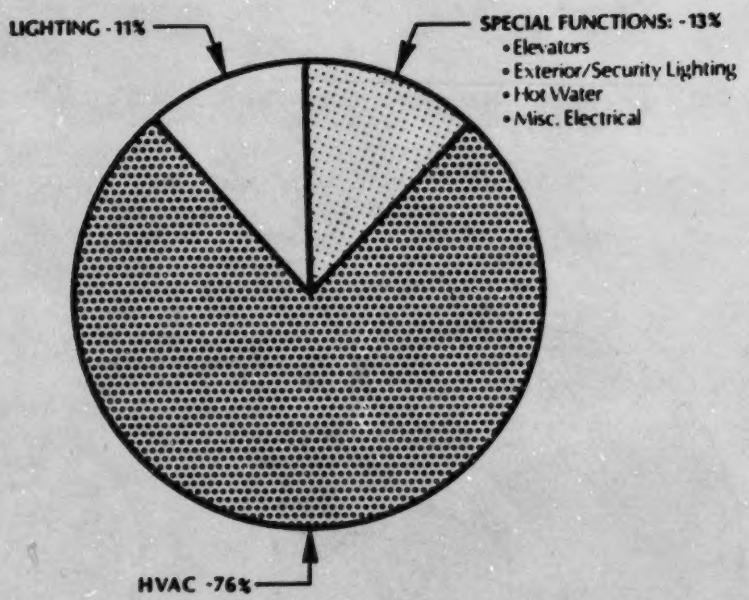


MAJOR ENERGY END USES IN A TYPICAL U.S. HOSPITAL

(Adapted from Practical Energy Management in Health Care Institutions, Blue Cross of Greater Philadelphia, July 1788, Page 2)

PUBLIC BUILDINGS
(Local Government, Office-Type Facility)

Although consumption percentages will vary with buildings' designated functions and the climate zones in which they are located, the figure below illustrates major energy uses of a "typical" office building. Again, space conditioning represents the area of highest consumption.



MAJOR ENERGY END USES IN A TYPICAL U.S. OFFICE BUILDING

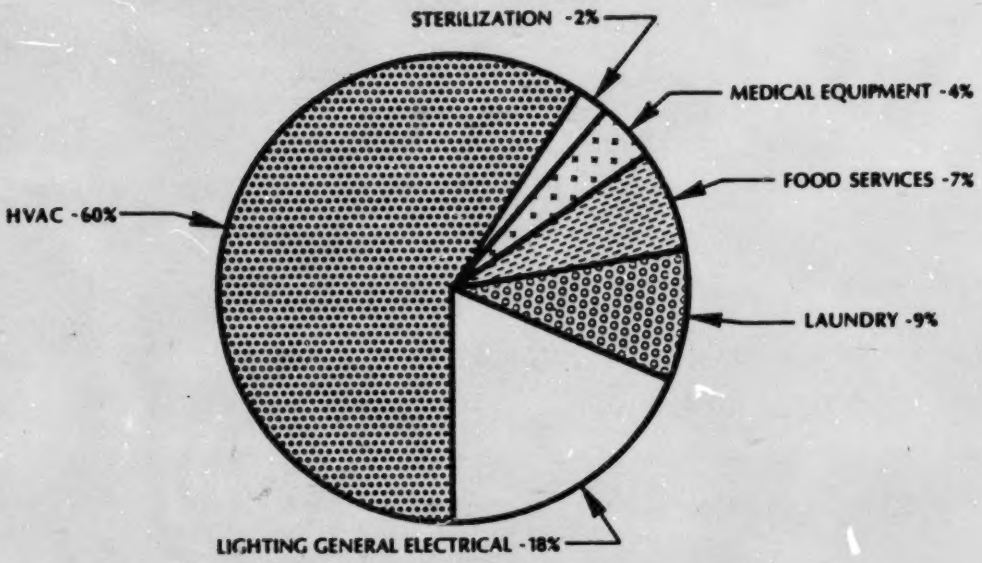
(Adapted from Energy Audit Workbook for Office Buildings, Fuel & Energy Consultants, Inc., 1978, Page 2)

LONG-TERM PUBLIC CARE FACILITIES

Public care facilities, such as nursing homes, which have not implemented comprehensive energy management programs, usually exhibit atypical energy consumption when compared to other buildings of a similar type, size, use, and climate zone[1]. It is not unusual to discover total energy consumption in the range of 300,000-360,000 BTU's per gross square foot per year, especially in the cooler climate zones.

The figure below indicates typical energy uses for a nursing home facility. Notice that space heating, cooling, ventilation, and lighting contribute to over three-fourths of the total consumption of the facility. These areas, then, represent major energy conservation opportunities.

[1] Nursing Homes Technical Report, Colorado Energy Conservation and Alternatives Center for Commerce and Industry, August 1978, Page 13).



MAJOR ENERGY END USES IN A TYPICAL U.S. NURSING HOME

(Adapted from Energy You Can Bank On, Colorado Energy Conservation and Alternatives Center for Commerce and Industry, 1978, Page 44)

Form EA-1 (1) Through (v) continued:

(2) Determination of major systems through the weighted formula that follows will provide estimates based on existing conditions as recorded on PEA-5 and PEA-6, as well as climate data.

The major building energy systems are generally in three categories: (1) HVAC energy; (2) lighting energy; (3) building process energy.

The formulas have been developed to establish major system energy use by a weighted factor (WF) method. Weighting factors for HVAC, lighting and process energy use are compared to the total weighting factor of all three and total energy use is proportioned according to their ratios.

The total weighting factor is calculated through the summation of:

Total WF = HVAC WF + Lighting WF + Process WF where:

HVAC WF = Occupancy/Operating Ratio WF (PEA-5, 2.0)
+ % Glass/Infiltration WF (PEA-5, 4.2)
+ HVAC System WF (PEA-5, 4.4)
+ Outside Air WF (PEA-5, 4.5)
+ Fan Energy WF (PEA-5, 4.6)
+ HVAC Control WF (PEA-6, 4.7),

Lighting WF = (PEA-5, 4.3), and

Process WF = (PEA-6,4.8).

To determine major system energy use in BTU:

A. HVAC Energy (BTU) = $\frac{\text{HVAC WF}}{\text{Total WF}}$ x Total Annual BTU (PEA-2, ggg).

To determine energy use by type, the HVAC energy must be broken down further into:

(1) Fan and Pump Electric Energy (BTU) = HVAC Energy x 0.4

(2) Cooling Energy (BTU) = $\frac{\text{Degree Days Cooling*}}{\text{Degree Days Cooling*} + \text{Degree Days Heating*}}$ x HVAC Energy x 0.6

(3) Heating Energy (BTU) = $\frac{\text{Degree Days Heating*}}{\text{Degree Days Cooling*} + \text{Degree Days Heating*}}$ x HVAC Energy x 0.6

B. Lighting Energy (BTU) = $\frac{\text{Lighting WF}}{\text{Total WF}}$ x Total Annual BTU (PEA-2, ggg)

To convert from BTU to purchased units, determine the source of energy for each category and divide by the appropriate conversion factors on EA-1, (x). An estimate of the types of process energy proportions must be made, as well as determining the type of source energy for cooling (electric, gas, or oil for absorption) and cooling (gas, oil, or electric) from PEA-1.

The following example for "BUILDING T" will illustrate this procedure.

*Degree Days Cooling and Heating from EA-2, 4.2.

MAJOR SYSTEMS ENERGY USE EXAMPLE

BUILDING "T"

175,000 Gross Square Feet
4 Floors
3 Years Old
25% Glass

Annual Energy Use: 300,000 BTU/Square Foot/Year

Occupancy/Operating Ratio: 0.4

Average Installed Lighting: 3 Watts/Square Foot (Fluorescent)

Predominant HVAC System: Multi-Zone Units

Average Building Outside Air: 30%

Total Installed Supply Fan Horsepower: 120

Control System Maintenance Contract with: XYZ, Inc.

Gas-Fired Steam Boiler Rated Capacity: 15,000 MBH

Electric-Drive Centrifugal Chiller: 600 Tons

Building Process Energy Base Load: Approximately 20%

Average Annual Heating Degree Days: 1,570

Average Annual Cooling Degree Days: 2,994

OPTIONAL

(This Chart is required with TA application for unmetered buildings)

PRELIMINARY ENERGY AUDIT

FORM PEA-5 4-79 Revised 5/1/79

BUILDING "T"

(b) BUILDING NAME & I.D. NUMBER

(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

VII BUILDING ENERGY SAVING POTENTIAL

(ttt) CHART OF POTENTIAL ENERGY SAVINGS

1.0 ANNUAL ENERGY USE: (SEE EUI PAGE PEA-2)

BTU/SQ.FT./YR.	WF
400,000 AND ABOVE	9
300,000 TO 400,000	8
200,000 TO 300,000	(7)
100,000 TO 200,000	6
LESS THAN 100,000	5

2.0 RATIO OF OCCUPANCY/SPACE UTILIZATION HOURS TO HVAC EQUIPMENT OPERATING HOURS:

OCCUPANCY/UTILIZATION HRS. / HVAC OPERATING HOURS = RATIO

RATIO	WF
UNDER 0.20	14.4
0.2 TO 0.4	12.8
0.4 TO 0.6	(11.2)
0.6 TO 0.8	9.6
0.8 TO 1.0	8.0

3.0 RATED CAPACITY OF HEATING & COOLING EQUIPMENT:

COMBINED HVAC CAPACITY IN BTUH X 10^6	WF
40 AND ABOVE	(9)
25 TO 40	8
15 TO 25	7
5 TO 15	6
BELOW 5	5

4.0 BUILDING MODIFICATION POTENTIAL:

4.1 BUILDING AGE & REMAINING LIFE (R.L.)

	WF
NEW (1-5 YRS) OVER 40 YR. R.L.	3.6
NEW (1-5 YRS) UNDER 40 YR. R.L.	(3.2)
RECENT (5-15 YRS) OVER 40 YR. R.L.	2.8
RECENT (5-15 YRS) UNDER 40 YR. R.L.	2.4
OLD (OVER 15 YRS)	2.0
OLD (OVER 15 YRS) LESS THAN 5 YR. R.L.	0.0

4.2 TOTAL WALL AREA PERCENT GLASS & INFILTRATION:

% GLASS RANGE	WF
OVER 40% GLASS	4.5
LARGE INFILTRATION	4.0
UNDER 40% GLASS	(3.5)
LOW INFILTRATION	3.0
UNDER 15% GLASS	2.5

4.3 LIGHTING LEVELS POTENTIAL REDUCTION:

RANGE	WF
REDUCED TO 3.0 W/SQ.FT.	6.3
REDUCED TO 2.0 - 3.0 W/SQ.FT.	(5.6)
REDUCED TO 1.0 - 2.0 W/SQ.FT.	4.9
CAN REDUCE BY SWITCHING CHANGES	4.2
LIGHTING LEVELS CANNOT BE REDUCED	3.5

4.4 PREDOMINANT HVAC SYSTEM:

TYPE	WF
DUAL DUCT OR REHEAT	12.6
MULTIZONE OR INDUCTION UNITS	(11.2)
ROOFTOP, PACKAGED WALL UNITS, OR UNIT VENTILATION	9.8
FAN-COIL, VAV, OR HEAT/VENT ONLY UNITS	8.4
RADIATION, UNIT HEATERS (NO FAN SYS.)	7.0

4.5 NORMAL OUTSIDE AIR SUPPLY PERCENTAGE:

RANGE	WF
75 TO 100%	8.1
50 TO 75%	7.2
25 TO 50%	(6.3)
10 TO 25%	5.4
INFILTRATION ONLY WITH TOILET EXHAUST	4.5

4.6 FAN ENERGY:

FAN STATIC PRESS.	GROSS BLDG. SQ.FT./FAN HP	WF
10" OR ABOVE	≤ 200 SQ.FT./HP	5.4
8" SP TO 10" SP	≤ 600 SQ.FT./HP	4.8
6" SP TO 8" SP	≤ 1000 SQ.FT./HP	4.2
4" SP TO 6" SP	≤ 1500 SQ.FT./HP	(3.6)
UNDER 4" SP	≤ 2000 SQ.FT./HP	3.0

OPTIONAL

(This Chart is required with TA application for unmetered buildings)

PRELIMINARY ENERGY AUDIT

FORM PEA-6 4-79 Revised 5/1/79

(b) BUILDING NAME & I.D. NUMBER: BUILDING "T"

(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER:

VII BUILDING ENERGY SAVING POTENTIAL (CONT'D)

CHART OF POTENTIAL ENERGY SAVINGS (Continued)

4.7 HVAC CONTROL SYSTEM:

CONDITION	WF
OUTSIDE AIR & RELIEF DAMPERS HANG OPEN	5.4
INOPERATIVE CONTROLS	4.8
NO WRITTEN PREVENTIVE MAINT. PROGRAM	4.2
CONTROLS ARE SERVICED REGULARLY	3.6
CONTROLS UNDER MAINTENANCE CONTRACT	(3.0)

4.8 BUILDING PROCESS ENERGY BASE LOAD:

% OF TOTAL LOAD	WF
20% BASE LOAD - COULD REDUCE	(2.7)
15% BASE LOAD - COULD REDUCE	2.4
10% BASE LOAD - COULD REDUCE	2.1
5% BASE LOAD - COULD REDUCE	1.8
NO REDUCTION OF BASE LOADS POSSIBLE	1.5

4.9 HVAC HEAT RECOVERY:

RANGE	WF
100% O.A., RECOVERY FEASIBLE	4.5
75% O.A., RECOVERY FEASIBLE	4.0
50% O.A., RECOVERY FEASIBLE	3.5
100% O.A., RECOVERY DIFFICULT	(3.0)
HEAT RECOVERY NOT FEASIBLE	2.5

4.10 USER RETROFIT TOLERANCE:

RANGE	WF
USER CAN TOLERATE MAJOR RETROFIT	(4.5)
USER CAN TOLERATE MINOR RETORFIT	3.5
USER CANNOT TOLERATE ANY DISRUPTIONS	2.5

ENERGY SAVING POTENTIAL TABULATION (uuu)

ITEM	WF
1.0 ANNUAL ENERGY USE	7.0
2.0 RATIO UTILIZ. HRS. TO OPER. HRS.	11.2
3.0 RATED CAP. OF HVAC EQUIP.	9.0
4.0 MODIFICATION POTENTIAL	
4.1 BUILDING AGE & LIFE EXPECT.	3.2
4.2 PERCENT GLASS & INFILTRATION	3.5
4.3 LIGHTING LEVELS	5.6
4.4 HVAC SYSTEM TYPE	11.2
4.5 OUTSIDE AIR RATIO	6.3
4.6 FAN ENERGY	3.6
4.7 HVAC CONTROL SYSTEM	3.0
4.8 BUILDING BASE LOAD	2.7
4.9 HVAC HEAT RECOVERY	3.0
4.10 USER RETROFIT TOLERANCE	4.5
TOTAL	73.8

BUILDING "T"

A. Total WF = HVAC WF + Lighting WF + Process WF

= (11.2 = 3.5 + 11.2 + 6.3 + 3.6 + 3.0) + 5.6 + 2.7

= 38.8 + 5.6 + 2.7 = 47.1

B. HVAC Energy = $\frac{38.8}{47.1}$ x 52,500 x 10^6 BTU

= 43,248 x 10^6 BTU

(1) Fan and Pump Electric Energy = 43,248 x 10^6 BTU x 0.4

= 17,299 x 10^6 BTU

= $\frac{17,299 \times 10^6 \text{ BTU}}{11,600 \text{ BTU/KWH}}$ = 1,491,293 KWH

(2) Cooling Energy = $\frac{2,994}{2,994 + 1,570}$ x 43,248 x 10^6 BTU x 0.6

= 17,023 x 10^6 BTU

= $\frac{17,023 \times 10^6 \text{ BTU}}{11,600 \text{ BTU/KWH}}$ = 1,467,457 KWH

(3) Heating Energy = $\frac{1,570}{2,994 + 1,570}$ x 43,248 x 10^6 BTU x 0.6

= 8,926 x 10^6 BTU

= $\frac{8,926 \times 10^6 \text{ BTU}}{1,030,000 \text{ BTU/MCF}}$ = 8,666 MCF

C. Lighting Energy = $\frac{5.6}{47.1}$ x 52,500 x 10^6 BTU

= 6,242 x 10^6 BTU

= $\frac{6,242 \times 10^6 \text{ BTU}}{11,600 \text{ BTU/KWH}}$ = 538,106 KWH

D. Process Energy = $\frac{2.7}{47.1}$ x 52,500 x 10^6 BTU

= 3,009 x 10^6 BTU

Process loads in Building "T" are all electric; therefore:

$\frac{3,009 \times 10^6 \text{ BTU}}{11,600 \text{ BTU/KWH}}$ = 259,396 KWH

Please return to Governor's Office of Energy Resources, 7703 N. Lamar, #502, Austin, Texas 78752. **E N E R G Y A U D I T**

Energy Auditor Certification: I hereby certify that I, _____(name of auditor), have participated fully in the Energy Auditor Training Program developed by the Governor's Office of Energy Resources conducted at _____(address of training site) by _____ (Sponsoring Agency-Instructor) on _____(date), or in lieu of attending the training session, have completed _____(# of classroom hrs) hours of educational courses and/or on-the-job experience in analyzing and/or operating the mechanical and electrical and other energy using systems of the type of building or complex being audited. I have attached a copy of official educational transcripts and/or resumes of previous applicable work experience including the address and telephone numbers of such employers if I have claimed past education and/or work experience in lieu of attending the official training program. I further certify that I am not responsible for the day-to-day operations of the building and that a full disclosure of any financial interest which I might have relating to this energy audit or any energy conservation measure is attached hereto. I also certify that the energy audit was conducted in accordance with the requirements set forth under 10 CFR Part 450, paragraph 450.43 of the regulation which was published in the Federal Register dated April 2, 1979.

Signature of Energy Auditor | Social Security No. of Energy Auditor | Organization of Auditor | (a) Date

(b) BUILDING "T" — BUILDING OR COMPLEX NAME & ID NUMBER — # OF BLDGS

(c) 175,000 — BUILDING SIZE (GROSS SQ.FT.)

FOLLOWING PEA FORMS COMPLETED ATTACHED HERETO:

(d)_____ PEA-1, (d1)_____ PEA-2, (e)_____ PEA-3, (e1)_____ PEA-4, (f)_____ PEA-5, (f1)_____ PEA-6

(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

NAME AND ADDRESS OF OWNER

THE CONTENT OF THIS AUDIT FORM IS DESIGNED TO MEET THE REQUIREMENTS OF FEDERAL REGISTER, APRIL 2, 1979. VOL. 44, No. 64, PARA. 450.43

I D E S C R I P T I V E B U I L D I N G D A T A

1.0 LIST MAJOR CHANGES IN "FUNCTIONAL USE" OR "MODE OF OPERATION" PLANNED FOR NEXT 15 YEARS:

(g)

2.0 FOR BUILDINGS OVER 200,000 GROSS SQUARE FEET AREA, PROVIDE THE FOLLOWING FROM AVAILABLE DATA (AD) OR BY REASONABLE ESTIMATE (BE) IDENTIFY SOURCE IN ALL BLANKS.

2.1 PEAK ELECTRICAL DEMAND IN KW: (h)

MONTHS (h1)_____, _____, _____, DAY (j)_____, _____, _____,

HOUR OF DAY (k)_____, _____, _____.

2.2 PROVIDE E[illegible] ANNUAL ENERGY USE OF THE MAJOR BUILDING SYSTEM BY F[illegible] TYPE:

3.0 GENERAL BUILDING & SYSTEMS CONDITION:

(y)

MAJOR SYSTEM (l)	ELECTRICITY KWH (m)	ELECTRICITY BTU (n)	NATURAL GAS MCF (o)	NATURAL GAS BTU (p)	#2 OIL GAL (r)	#2 OIL BTU (s)	CENTRAL PLANT THERMAL STEAM-HOT WATER (t) BTU	CENTRAL PLANT THERMAL CHILLED WATER TON HRS. (u)	CENTRAL PLANT THERMAL CHILLED WATER BTU (v)	TOTAL BTU (w)
HVAC	2,958,750	34,323,000,000	8,660	8,925,980,000						43,248,980,000
LIGHTING	538,106	6,242,000,000								6,242,000,000
PROCESS	259,396	3,010,000,000								3,010,000,000

BTU CONVERSION FACTORS (x) (You may round to nearest million.)

ELEC.	KWH	X 11,600	= BTU	STEAM/HW	MMBTU x 1,000,000	=	BTU
NAT.GAS.	MCF	X 1,030,000	= BTU	STEAM	LBS x 1,390	=	BTU
OIL #2	GAL	X 138,690	= BTU	CH.WATER	TON HR x 12,000	=	BTU
OIL #6	GAL	X 149,690	= BTU	OTHER	x	=	BTU
				OTHER	x	=	BTU

FORM EA-1 4/79 Revised 4/23/79 Revised 5/1/79

EA-2

4.0 Obtain current weather data from local weather station.

(z) The point is to prove that M&O's along have resulted in a 20% energy-use reduction. If you can prove this level of savings, the auditor need not complete Page EA-3. It will probably be less time consuming to omit this table and proceed directly to EA-4 as an alternative.

EA-3

Refer to the list of M&O measures included in this manual for specific examples of "System Changes". The percent values provided can be interpreted as weighting factors, and the values should not be changed, even if a higher percentage savings is possible for a particular building. If the estimated savings is less than the percentage shown, do not circle that M&O, as it is insignificant in energy savings.

EA-4

(ddd)(eee)(fff) For additional examples, refer to the ECM/P section of this manual.

(ggg) Enter the MOST SIGNIFICANT ECM discovered in that building.

(hhh)(iii) The auditor will probably have to rely heavily on the operator's opinion for this information.

COMPLETED SAMPLES:

ECC, PEA, AND EA FORMS AND INSTRUCTIONS

Included in this section are forms which have been completed for a sample building.

ENERGY COST AND CONSUMPTION SUMMARY FORMS (ECC-1 -6)

The energy cost and consumption summary forms are presented as a suggested method of monitoring energy consumption in buildings, especially before and after the implementation of maintenance and operating procedures and the installation of energy conservation measures. Such information is required by 10 CFR 455, Para. 455.63 C which states that "such annual reports shall identify each building and shall provide data on the actual energy use of that building...on a monthly or quarterly as well as annual basis consistant with the annual billing cycle for the building".

INSTRUCTIONS

ENERGY COST AND CONSUMPTION SUMMARY FORMS (ECC-1 - 6)

ECC-1: ELECTRICITY

(d) Building size (expressed as millions of gross square feet), including significant areas which are not heated or cooled.

(e) Number of calendar days shown on billing.

(f)(j) Demand will be in terms of KVA OR KW. Fill in appropriate factor as shown on billing.

(g) Power factor as shown on billing.

(k) Monthly demand charges from billings or rate schedule.

(l) Thousands of kilowatt hours (1,215,627 KWH would be entered as 1,215.)

(m) Actual consumption (KWH) divided by the projection of what the consumption would have been if usage were at the demand (peak) rate for each hour in the billing period.

(n) Obtained from billing.

(o) Obtained from billing.

(p) Total monthly billing divided by total monthly consumption. ($.0236 would be entered as 2.36¢ per KWH).

(r) Converts kilowatt hours used in the building to millions of BTU's.

(s) Converts kilowatt hours used in the building to millions of BTU's required to generate the electricity at the power plant. This number is larger because power plants are not 100% efficient, and distribution losses are also unavoidable.

(t)(u) Site and source building energy usage per square foot expressed as thousands of BTU's per square foot.

NOTE: When performing mathematical computations, it is suggested that all table entries be converted from millions or thousands to the actual number, using all significant zeros. For example, convert 1,215 x 10^3 KWH entered in Column (1) to 1,215,000 prior to any calculations.

ECC-2: NATURAL GAS

(f) Thousands of cubic feet from monthly billing. (Be sure that billing is expressed in thousands.)

(h) Enter 1,030 BTU's per cubic foot as the heat content of natural gas.

(j) Gas cost expressed as dollars per thousand cubic feet of gas consumed.

(k) Convert thousands of cubic feet to millions of BTU's.

(l) Disregard column for source energy.

(m) Energy consumption expressed in thousands of BTU's per square foot.

(n) Disregard column.

(p) Fuel cost per million BTU's.

ECC-3: CHILLED WATER AND STEAM OR HOT WATER
(If steam heat, cross out hot water and vice versa.)

(h) Chilled water is usually billed in "ton-hours".

(j) Steam/hot water is usually billed in terms of millions of BTU's.

(k) Disregard if not shown on bill.

(m) Compute total heating and cooling energy by converting ton-hours of cooling to millions of BTU's (multiply "h" by .012) and adding the heating energy entered in Column j. Enter sum in Column m.

(n) Disregard entry

(p) Disregard entry.

(r) Dollars per square foot.

(s) Dollars per million BTU's.

ECC-4: FUEL OIL/PROPANE

Completion of this form is similar to previous ECC forms, with the exception that fuel oil and propane are billed in gallon quantities. These quantities are converted to BTU's, and using conversion factors provided, entered in the appropriate columns.

(n) (p) Disregard columns.

ECC-5: OTHER FUELS

If a fuel other than those previously mentioned is used to heat or cool the building, enter the appropriate data on ECC-5. BTU values for other fuels can be obtained in most engineering handbooks.

ECC-6: WATER

(h)(j) These columns are for recording heating and cooling degree days obtained from the weather station nearest the building being audited. Refer to the Appendix in this manual for example of standard weather data information. Published weather data is available on a monthly basis (approximately 30 days after the last day of the month) and as an annual summary which is published in April or May of each year. In addition, degree day information may be requested by telephone from weather stations. In any event, be sure that the degree days entered are for the appropriate month of that year and not for some previous year.

(SAMPLE)

U.T.S.A. (MAIN CAMPUS) - 401
(a) BUILDING NAME AND I. D. NUMBER

(c) FISCAL YEAR 1976-77

(v) METER TYPE: K. W. X KVAR — DEMAND PERIOD:
KWH X OTHER — 15 Min. X Other — Min.

ELECTRICITY:

MONTH	10^3 GROSS SQ. FT. BUILDING SIZE (d)	DAYS IN BILLING PERIOD (e)	DEMAND KVA (f)	DEMAND P.F. (g)	DEMAND KW (j)	DEMAND CHARGE $ (k)	10^3 KWH (l)	LOAD FACTOR (m)	FULL COST ADJUST. $ (n)	TOTAL CHARGES $ (o)	COST PER KWH ¢ (p)	10^6 BTU TOTAL SITE (r)	10^6 BTU TOTAL SOURCE (s)	10^3 BTU PER SQ. FT. SITE (t)	10^3 BTU PER SQ. FT. SOURCE (u)
SEPTEMBER	799.9	30	N.A.	.92	3,192	7,062	1,316.0	.57	26	37,227	2.83	4491.5	15266	5.62	19.08
OCTOBER	799.9	32		.92	3,136	6,939	1,360.8	.56	(640)	37,491	2.76	4,644.5	15,785	5.81	19.73
NOVEMBER		31		.92	3,416	7,555	1,349.6	.53	1,039	39,456	2.92	4,606.0	15,655	5.76	19.57
DECEMBER		33		.91	3,080	6,816	1,215.2	.50	12,310	46,953	3.86	4,147.5	14,096	5.19	17.62
JANUARY		29		.91	3,136	6,939	1,282.4	.59	(4565)	31,747	2.48	4,377.0	14,876	5.47	18.60
FEBRUARY		29		.91	3,136	6,939	1,349.6	.62	13	37,885	2.81	4,606.0	15,655	5.76	19.57
MARCH		29		.92	3,136	6,939	1,344.0	.62	3320	41,061	3.06	4,587.0	15,590	5.73	19.49
APRIL		32		.92	3,136	6,939	1,332.8	.55	2266	39,747	2.98	4,549.0	15,460	5.69	19.32
MAY		30		.92	3,080	6,816	1,148.0	.52	1722	34,808	3.03	3,918.0	13,317	4.90	16.65
JUNE		29		.92	3,080	6,816	1,260.0	.59	3125	38,809	3.08	4,300.5	14,616	5.38	18.27
JULY	↓	32		.92	3,024	6,693	1,304.8	.62	(496)	36,118	2.77	4,453.5	15,136	5.57	18.92
AUGUST	799.9	29		.92	3,136	6,939	1,198.4	.55	1019	35,383	2.95	4,090.0	13,901	5.11	17.38
ANNUAL TOTALS	799.9	365	↓	AVG. .92	AVG. 3,141	83,392	15,461.6	AVG. .56	19,139	456,685	AVG 2.95	52,770.5	179,353	65.97	224.22

IN KWH
(m) = (l) + [(j) x (e) x 24 hrs.]
(r) = (l) x 3.413
(s) = (l) x 11.80

ANNUAL PEAK DEMAND: 3416

(t) = (r) ÷ (d)
(u) = (s) ÷ (d)
(p) = (o) ÷ [(l) x 1000]

NAME OF ELECTRIC UTILITY: CITY PUBLIC SERVICE
ADDRESS: P.O. Box 7678, S.A. Tx. 78289
TELEPHONE: 512-225-2541
CONTACT: JIM BOWEN
ELECTRIC RATE DESIGNATION: LLP

ANNUAL ELECTRIC COST PER SQ. FT. = ANNUAL TOTAL (o) ÷ (d) = $456,605 / 799,900 = $0.57

ANNUAL ELECTRIC BTU COST/MMBTU (1,000,000 BTU) = ANNUAL TOTAL (o) ÷ ANNUAL TOTAL (r) = $456,685 / 52,770.5 = $8.65 (COST AT SITE)

* INDICATES SOME POSSIBLE ENTRY CONFUSION

FORM ECC-1 2/79 REV 3/79

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(SAMPLE)

U.T.S.A. (MAIN CAMPUS) - 401
(a) BUILDING NAME AND I. D. NUMBER

FISCAL YEAR 1976-77
(c)

NATURAL GAS: *

(b) HEAT CONTENT (at site) 1033 BTU PER CU. FT. ← (MAY VARY FROM MONTH-TO-MONTH)

MONTH	10^3 GROSS SQ. FT. BUILDING SIZE (d)	DAYS IN BILLING PERIOD(e)	BILLED M C F (f)	FUEL COST ADJUST. ¢ (g)	TOTAL CHARGES $ (h)	COST PER M C F ¢ (j)	10^6 BTU TOTAL SITE (k)	10^6 BTU TOTAL SOURCE (l)	10^3 BTU PER SQ. FT. SITE (m)	10^3 BTU PER SQ. FT. SOURCE (n)	FUEL COST ¢ PER SQ. FT.(o)	FUEL COST PER MMBTU ¢ SITE (p)	
SEPTEMBER	826.1	30	277.5	49	597	2.15	286.7	N.D.A.	.325	N.D.A.	.07	2.08	
OCTOBER		30	638.7	91	1314	2.06	659.8		.799		.16	1.99	
NOVEMBER		33	1059.4	129	2139	2.02	1094.4		1.325		.26	1.95	
DECEMBER		33	1169.5	202	2418	2.07	1208.1		1.462		.29	2.00	
JANUARY		35	1413.0	(288)	2384	1.69	1459.6		1.767		.29	1.63	
FEBRUARY		24	665.4	315	1383	2.38	687.4		.832		.19	2.30	
MARCH		28	710.3	337	1694	2.38	733.7		.888		.21	2.31	
APRIL		32	933.1	442	2216	2.37	963.9		1.167		.27	2.30	
MAY		30	804.7	381	1915	2.38	831.3		1.006		.23	2.30	
JUNE		30	717.1	255	1625	2.27	740.8		.897		.20	2.19	
JULY	↓	32	724.6	85	1469	2.03	748.1		.906		.18	1.96	
AUGUST	826.1	29	620.1	115	1303	2.10	640.6		.775		.16	2.03	
ANNUAL TOTALS	826.1	366	9,733.4	2,113	20,657	AVG. 2.12	10,054.6	↓	12,171	↓	TOTAL 2.51¢	AVG. $2.05	← *

(j) = (h) ÷ (f)
(k) = (f) × (b) ÷ 1000
(l) = (f) × (b) ÷ 1000 (†)
(m) = (k) ÷ (d)
(n) = (l) ÷ (d)
(o) = (h) ÷ (d) × 1000
(p) = (h) ÷ (k)

(†) ← N.D.A.

* ↑

* NAME OF GAS UTILITY: CITY PUBLIC SERVICE
ADDRESS: P.O. BOX 2678, S.A., TX. 78289
TELEPHONE: 512-225-2541
CONTACT: JIM BOWEN
GAS RATE: INDUSTRIAL, CLASS A
* ↑

* INDICATES POSSIBLE ENTRY CONFUSION

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(a) BUILDING NAME AND I.D. NUMBER

METER TYPE:

(c) FISCAL YEAR _____

CHILLED WATER and STEAM/HOT WATER (STRIKE ONE)

CHILLED WATER _____ METER MFGR. _____
STEAM _____ METER MFGR. _____
CONDENSATE _____ METER MFGR. _____

MONTH	10^3 GROSS SQ.FT. BUILDING SIZE (f)	DAYS IN BILLING PERIOD (g)	NET BILLED TON-HRS. CHILLED WATER (h)	NET BILLED MBTU STEAM/HW (j)	FUEL COST ADJUST. $ (k)	TOTAL CHARGES $ (l)	10^6 BTU TOTAL SITE (m)	10^6 BTU TOTAL SOURCE (n)	10^3 BTU PER SQ. FT. SITE (o)	10^3 BTU PER SQ. FT. SOURCE (p)	ENERGY COST PER SQ.FT. $ (r)	ENERGY COST $ PER MONTH (TOTAL) SITE (s)	
SEPTEMBER													
OCTOBER													
NOVEMBER													
DECEMBER													
JANUARY													
FEBRUARY													
MARCH													
APRIL													
MAY													
JUNE													
JULY													
AUGUST													
	**	*	*	*	*$	*$	*	*	*	*	*$	$ AVG.	

* ANNUAL TOTAL
** SAME AS AUGUST

(m) = (h) x 0.012 ÷ (j)
(n) = (m) x (1.0+) Factor (7) N.C.A.
(o) = (m) ÷ (f)
(p) = [(m) ÷ (f)] x (1.04) Factor (7) N.C.A.

(r) = (l) ÷ [(f) x 1000]
(s) = (l) ÷ (m)

NAME OF UTILITY: : _____
ADDRESS: : _____
TELEPHONE: _____
CONTACT: _____
RATES: _____

FORM ECC-3 2/79 REV. 3/79

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(a) BUILDING NAME AND I. D. NUMBER _____ (c) FISCAL YEAR _____

(d) FUEL OIL: _____ #2 @ 138,690 BTU/GAL., _____ #6 @ 149,690 BTU/CAL SOURCE BTU/GAL. _____

(e) PROPANE: _____ AT 95,476 BTU/GAL., _____ OTHER _____ BTU/GAL. SOURCE BTU/GAL. _____

MONTH	10^3 GROSS SQ. FT. BUILDING. SIZE (f)	DAYS IN BILLING PERIOD (g)	AMT. BILLED 10^3 GALLONS (h)	FUEL COST ADJUST. $ (j)	TOTAL CHARGES $ (k)	COST Per GAL. $ (l)	10^6 B T U TOTAL SITE (m)	10^6 B T U TOTAL SOURCE (n)	10^3 B T U PER SQ. FT. SITE (o)	10^3 B T U PER SQ. FT. SOURCE (p)	FUEL COST PER SQ. FT. $ (r)	FUEL COST PER MMBTU SITE $ (s)	
September													
October													
November													
December													
January													
February													
March													
April													
May													
June													
July													
August	**	*	*	*$	*$	AVG. $	*	*	*	*	F $	$ AVG.	

* ANNUAL TOTAL - ** SAME AS AUGUST

(l) = (k) ÷ (h) x 1000
(m) = (h) x [(d) or (e) ÷ 1000]
(n) = (m) x (1.0+) factor N.O.A.
(o) = (m) ÷ (f)
(p) = (n) ÷ (f)
(r) = (k) ÷ [(f) x 1000]
(s) = (k) ÷ (m)

NAME OF OIL-PROPANE SOURCE: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT: _____

FUEL RATE: _____

FORM ECC-4 2/79 REV. 3/79

(a) BUILDING NAME AND I.D. NUMBER _____

(c) FISCAL YEAR _____

OTHER FUEL TYPE: (d) FUEL NAME: _____

METERING METHOD & MFGR. _____ (b)

BTU CONTENT PER UNIT MEASURE _____ (c)

MONTH	10^3 GROSS SQ. FT. BUILDING SITE (f)	DAYS IN BILLING PERIOD (g)	QUANTITY BILLED (h)	FUEL COST ADJUST. ¢ (i)	TOTAL CHARGES ¢ (k)	COST PER FUEL UNIT ¢ (l)	10^6 B T U T O T A L		10^3 B T U PER SQ. FT.		FUEL COST PER SQ.FT. ¢ (r)	FUEL COST PER MBTU SITE ¢ (s)	
							SITE (m)	SOURCE (n)	SITE (o)	SOURCE (p)			
SEPTEMBER													
OCTOBER													
NOVEMBER													
DECEMBER													
JANUARY													
FEBRUARY													
MARCH													
APRIL													
MAY													
JUNE													
JULY													
AUGUST													
	**	*	*	*¢	*¢	¢ AVG.	*	*	*	*	*¢	¢ AVG.	

*ANNUAL TOTAL .** SAME AS AUGUST

(h) - from billing
(l) = (k) ÷ (h)
(m) = (h) x (t) ÷ 10^6
(n) = (m) x (1.04) Factor (7) N.M.A.
(o) = (n) ÷ (f)
(p) = (n) ÷ (f)
(r) = (k) ÷ (f)
(s) = (k) ÷ (m)

NAME OF UTILITY CO.: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT: _____

RATE: _____

FORM ECC-5 3/79 REV. 3/79

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(SAMPLE)

U.T. SAN ANTONIO (MAIN CAMPUS) – 401
(a) BUILDING NAME AND I. D. NUMBER

(c) FISCAL YEAR 1976-77

CITY WATER *

(g) METER TYPE: TURBINE X; POS. DISPL. —; OTHER —

METER MFGR. * HERSEY

MONTH	HEATING DEGREE DAYS (h)	COOLING DEGREE DAYS (i)	DAYS IN BILLING PERIOD (k)	BILLED CCF: DOMESTIC B.E. (l)	BILLED CCF: IRRIGATION B.E. (m)	BILLED CCF: PROCESS B.E. (n)	BILLED CCF: TOTAL (o)	TOTAL CHARGES $ (p)	COST PER CCF $ (r)	CCF PER 1000 SQ.FT. (s)	10^3 GROSS SQ. FT. BUILDING SIZE (t)
SEPTEMBER	0	383	30	4,288	7,638	3,880	15,806	4,007	.25	19.1	826.1
OCTOBER	160	45	31	4,288	11,373	2,190	17,851	4,704	.26	21.6	
NOVEMBER	382	0	30	4,288	8,719	1,758	14,765	3,902	.26	17.9	
DECEMBER	461	0	30	3,216	11,322	1,818	16,356	4,315	.26	19.8	
JANUARY	643	0	32	3,216	11,822	1,835	16,873	4,450	.26	20.4	
FEBRUARY	336	3	28	3,216	11,153	2,238	16,607	4,381	.26	20.1	
MARCH	144	158	31	3,216	10,487	2,847	16,550	4,366	.26	20.0	↓
APRIL	32	98	30	3,216	10,567	2,567	16,350	4,314	.26	19.8	826.1
MAY	0	311	30	2,144	10,931	3,155	16,230	4,283	.26	19.4	835.8
JUNE	0	502	31	2,144	9,676	4,750	16,570	4,371	.26	19.8	
JULY	0	620	31	2,144	9,553	5,103	16,800	4,431	.26	20.1	↓
AUGUST	0	681	31	2,144	6,850	5,856	15,850	4,184	.26	19.0	835.8
ANNUAL TOTAL	2,158	2,701	365	41,808	116,803	37,997	196,608	51,708	.26	237.0	835.8

SEE "LOCAL" WEATHER DATA FOR DEGREE DAY ENTRIES

CCF = 100 CU. FT. = 748 GAL. = 6235.5 lbs.
1000 Gal = 1.34 C.C.F.

FOR (l), (m), and (n) USE BEST ESTIMATE IF NOT METERED SEPARATELY

(o) = CCF FROM BILLING
(r) = (P) ÷ (o)
(s) = (o) ÷ (t) x 1000 = CCF/SQ.FT.
(s) = (o) ÷ (t) = CCF/1000 SQ.FT.

NAME OF CITY WATER UTILITY: CITY WATER BOARD
ADDRESS: P.O. Box 2449, S.A., Tx. 78298
TELEPHONE: 512-225-7461
CONTACT: WALTER GARRISON
RATES: WATER: $ 7340 – FOR 1ST 750 CCF
0.19 – ALL REMAINING CCF
SEWER: $ 7176 – FOR 1ST 500 CCF
0.07 – ALL REMAINING CCF

* INDICATES POSSIBLE ENTRY CONFUSION.

FORM ECC-6 2.79 REV. 8/79

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4/23/79
Revised

STATE OF TEXAS

PRELIMINARY ENERGY AUDIT PROCEDURES

The purpose of the Preliminary Energy Audit (PEA) is to determine the energy savings potential of buildings by identifying the physical and energy-using characteristics of the buildings. The major components of the PEA include major energy using systems identified in terms of fuel source and physical characteristics, prior building energy conservation efforts, renewable energy resource potential, and energy savings potential. The PEA is to provide basic building information which will identify those large energy using buildings and systems which will become candidates for subsequent Energy Audits (EA: on-site audit, and "EA" form information), Technical Assistance (TA: detailed engineering energy analysis) and Energy Conservation Measures (ECM: funding for materials, equipment and labor).

A Preliminary Energy Audit report and an Energy Audit report must be completed for each building or complex for which you submit a Technical Assistance and Energy Conservation Measure application. If a TA application is submitted for a building, then there must also be a PEA and EA submitted for the same building and not for the complex which the building is a part.

The PEA Forms PEA-1, PEA-2, PEA-3, PEA-4, PEA-5, and PEA-6 are designed to gather basic energy using information with a minimum of on-site effort. The PEA Auditor will complete the forms by working with the Component Institution's Physical Plant Department, the Component Institution's Energy Manager, and other personnel where necessary, and by visual observation of the building.

The numerical entries are to be obtained from Component Institution's records, Component Institution's best estimates, and by simple mathematical multiplication and division operations. All PEA Form entry blanks must have an entry. Entries to be noted as follows:

"RD" - Record Data
"BE" - Best Estimate
"NDA" - No Data Available
"NA" - Not Applicable to this Building

Draw a straight horizontal line through spaces or blanks not used to indicate that the blank or space was not overlooked. All positive responses to questions should be marked with an "X".

The following procedures provide instructions for completing the PEA Forms. The small case alphabet letters in parentheses key to the form entry data. All addresses are to be complete, current street addresses include ZIP Code. Provide telephone numbers if available.

The PEA Forms PEA-1, PEA-2, PEA-3, PEA-4, PEA-5, and PEA-6 are designed to meet the requirements of Federal Register, Vol. 44, No. 64, Paragraph 450.42, dated April 12, 1979.

The PEA form must be returned directly to the Governor's Office of Energy Resources, 7703 N. Lamar #502, Austin, Texas 78752. Please boldly print "PEA" in the bottom right corner of the envelope.

FORM PEA-1

(a1) Enter the calendar date on which the PEA is completed.

(a) Enter the component institution's name as provided by the building owner, and identification number. A component institution is a university within a system, or any other sub-grouping of the "owner," (g), not designated as a building or the "owner".

(b) Enter the Building or Complex Name and Identification Number as provided by the owner. Indicate whether the report covers a single building or a complex by circling the appropriate term. If complex, indicate the number of buildings in the complex.

(c) Enter the building address as provided by the owner. This will be the same as the component institution's address if the building is located within the site of the institution. Provide street address if building is located off campus or if building is leased with the intent to purchase (you must have legal documentation of intent to purchase if building is leased).

(d) Enter "school," "hospital," "local government," or "public care institution."

(e) Enter major category of building use taken from the following lists:

School:	Hospital:	Local Government:
Elementary	General	Office
Secondary	Tuberculosis	Storage
College	Other (specify)	Service
University		Library
Vocational		Police Station
LEA Admin.		Fire Station
"Other" (specify)		Other (specify)

Public Care Institution:

Nursing Home
Long-Term Care (other than nursing home)
Rehabilitation Facility
Public Health Center
Residential Child Care Center
"Other" (specify)

If the building or complex is "other," enter a one or two word description. For example, if a hospital is neither a general hospital nor a tuberculosis hospital, you would write "other" and add "psychiatric," "obstetrics and gynecology," "eye, ear, nose, and throat," "rehabilitation," "orthopedic," "chronic disease," or other appropriate brief description.

(f) Enter name and telephone number of person directly responsible for the day-to-day physical operations of the building. This is the person who maintains the HVAC system, adjusts thermostats, cleans filters, etc.

(g) Enter name and street address of "owner" of record and indicate whether the owner is a public institution, a private non-profit institution or an Indian Tribe.

(h) Enter building size expressed in gross square feet as measured from the outside perimeter of the building excluding areas which are neither heated nor cooled such as an attached parking garage.

(i) Enter date of original building construction completion. This date should be the same as the permit of occupany of the builder. If actual date is not known, you may enter the year of construction. Buildings constructed after April 20, 1977, are not eligible for federal funding under this program.

(jj) Enter name and street address of person conducting the PEA audit.

(j) through (n) Operating Schedule:

(j) Daylight hours, 6:00 am to 6:00 pm. Enter the number of "hours" of occupancy (utilization)/number of occupants/percent of building gross square footage used, in each of the blank fields indicated for the days of M-F (Monday through Friday), SAT (Saturday), and SUN (Sunday).

(k) Evening hours, 6:00 pm to 10:00 pm. Make entries of similar data requested in (j) above as applies to the evening hours.

(l) Night hours, 10:00 pm to 6:00 am. Make entries of similar data requested in (j) above as applies to the night hours.

(m) and (n) Partial usage. If the building operates on a seasonal schedule, or has other periods of at least a week's duration when the building is only partially occupied, enter the "number" of weeks of partial use (m) by calendar quarter and the "percent" of total building gross square footage in use (n) during such period.

(q) Check "yes" or "no". Is building provided with a centralized local building control panel? The central control panel would be identified as a grouping of switches, push buttons, or gauges; and will be most often located in the boiler room or central equipment room.

(s) Indicate whether or not the building HVAC system is connected to a central Facilities Control and Monitoring System (FCMS - such as a computer system). Check "yes" or "no."

(u) Enter source of primary building heat and heat source; such as "steam boiler," "hot water boiler," "purchased steam," "direct gas fired," "electrical resistance," "#2 fuel oil," "propane," "butane," "central plant." Indicate type of fuel.

(v) Enter source of primary building cooling; such as "electrical centrifugal chiller," "electric-reciprocating-unitary," "absorption chiller," "purchased chilled water," "campus chiller plant." Indicate energy source.

(w) Enter Primary Terminal devices for space heating system; such as "steam/hot water radiators," "convectors," "fan & coil," "unit ventilator," "ducted warm air."

(x) Enter Primary Terminal system for space cooling; such as, "room fan coil," "double duct," "reheat," "unit ventilators," "low pressure ducted."

(y) Enter source of domestic hot water supply; such as, "gas fired storage," "gas fired instantaneous," "electric storage," "steam generator storage," "oil fired storage."

(z) Enter type of internal lighting system; "incandescent," "fluorescent," "high intensity discharge," with estimated percentage of the number of each type of lighting fixture.

(aa) Enter brief descriptive phase on special building systems and facilities; such as, "food preparation and service," "food serving only," "domestic laundry facilities," "commercial laundry facilities," "steam labs," "ceramic labs," "chemistry labs," "biology labs," "operating rooms," "100% fresh air systems."

(bb) Check "yes" or "no."

(cc) Check "yes" or "no."

(dd) Check "yes" or "no."

(ee) Check "yes" or "no."

(ff) Check "yes" or "no."

(gg) Enter building additions and square footage, building modifications and types. Enter total number of additions and major modifications.

(hh) Enter any other pertinent unique information on building such as; "lightweight envelope," "tilt-up construction," "conversion plans," "year round office type occupancy," etc.

FORM PEA-2

(b) Enter the building name and building identification number. Same as item (b) on Form PEA-1.

(b1) Enter component institution's name and ID number.

(h) Enter building size. Same entry as item (h) on Form PEA-1.

(ii) The monthly data shall be reported for the year beginning September, 1977, and ending August, 1978. Indicate by "X" in appropriate side blank whether this data is "metered" or "best estimate" for this building. If this form is used in subsequent years, enter data for the most recent year ending in August.

(jj) (kk) (ll) (mm) (nn) (oo) (pp) (rr) (ss) (tt) (uu) (vv) (ww) and (xx) are to be provided by month as complete data will serve to your advantage in future consideration of energy audit grants. However, if you do not have your monthly billings to obtain monthly data, you may enter the annual totals for this time period if it is available. If actual metered values are not available for buildings in a complex, all centrally metered, then these values are to be the best estimate based on your knowledge of the building construction, function, and use. If Purchased Thermal Energy Cost Billings combine both MMBTU heat and Ton-Hrs cooling energy, then enter total purchased thermal costs under Col. (ww) and draw a horizontal line through blank at Col. (uu). "If this building is included in a group of central complex metered buildings, then make the best estimate of the weighted building individual totals as a part of the total campus-wide billings and quantities. Dollar values in Columns (kk), (nn), (rr), (uu), (ww), and (xx) are to be rounded off to the nearest whole dollar. Under "Annual Totals" entries, items (ll), (oo), and (ss) will be the average value for the year in cost per unit of energy; thus divide the annual total cost by the annual total energy unit (KWH, MCF, etc.). All other "Annual Totals" entries to be numerical totals of columnar values."

(yy) through (fff). If fuels are used other than the ones indicated in the above chart, you should mark out fuels not used and write in other fuels designating each name on the chart along with the appropriate monthly data.

(yy) Enter total annual "KWH" value from table above and multiply by factor on form.

(zz) Enter total annual "MCF" value from table above. Enter "N.A." if natural gas not used. Multiply by factor on form.

(aaa) Enter total annual "gallons" value from table above. Enter "N.A." if #2 fuel oil is not used. Multiply value by factor on form.

(bbb) Enter total annual "gallons" value from table above. Enter "N.A." if #6 fuel oil not used. Multiply value by factor on form.

(ccc1) or (ccc2) Enter total annual steam or high temperature hot water "MMBTU" or "LBS" value from table above. Cross out the MMBTU or LBS unit on the chart above if not used on your billing. Use either (ccc1) or (ccc2). Enter "N.A." if purchased steam or hot water not utilized. Multiply value by factor on form.

(ddd) Enter total annual Chilled Water "Ton Hours" from table above. Enter "N.A." if chilled water is not purchased. Multiply value by factor on form.

(eee) Enter total annual use of other fuel such as liquified petroleum gases including butane and propane (use conversion factor of 95,475 in (fff), and bituminous coal (use conversion factor of 24,500,000). Enter "N.A." if "other" fuel not used.

(fff) Enter heat content per unit of "other" fuel used expressed in BTU per unit. Obtain "other" fuel conversion factors (not mentioned above) from standard engineering reference manuals.

(ggg) Enter arithmetical total of the column of figures above.

(h) Enter (h) from (h) at top of page.

(hhh) Determine by dividing the value of (ggg) by the value of (h) above.

(xx) Enter (xx) from Annual Total of (xx) above.

(iii) Determine by dividing the value of (xx) "Annual Total" by the value of (h) above.

FORM PEA-3

(b) Enter the building name and building identification number. Same as item (b) on form PEA-1.

(b1) Enter component institution's name and ID number.

(jjj) Enter full name of designated Building Energy Manager if there is a person designated to monitor and evaluate energy use. If there is no Energy Manager, write "N.A."

(kkk) Place an "X" in the appropriate response blank. Draw a horizontal line through the other response.

(lll) Place an "X" in the appropriate response blank. Draw a horizontal line through the other response.

(mmm) Enter descriptive phrase for each system studied; such as, "lighting system," "ventilation system," "chilled water system," "air distribution system," "hydraulic system," "piping insulation system," etc.

(nnn) Place an "X" in the appropriate response blank. Draw a horizontal line through the other response.

(ooo) Enter descriptive phrase for each energy conservation measure considered or implemented; such as, "local light switch decals," "thermostat adjustment," "reset air delivery temperatures," "reset chilled water temperatures," "automatic duty-cycling of equipment," "unoccupied hours shut down," "reduced lighting levels," "added more local control switching," "increased filter maintenance schedule," "reduced outside air quantities," "installed electric metering," "installed fuel metering," "changed use schedules," "adjusted housekeeping schedules," "increased routine maintenance," "scheduled control system checkout, " etc.

(ppp) Enter general comments and observations which contribute to further definition of energy using character of building.

(rrr) Place an "X" in the appropriate response blank.

FORM PEA-4

(b) Enter the building name and building identification number. Same as (b) on PEA-1.

(b1) Enter component institution's name and ID number.

Items 1 through 11 are information requests regarding the building site, construction, and heating and domestic water systems as related to solar energy application potential. Item 12 refers to other potential renewable resource energy source applications. Auditor to mark all positive responses in various blank spaces with an "X". Draw a single, horizontal dash line through all other blank spaces not applicable to building audited.

FORM PEA-5

(b) Enter the building name and building identification number. Same as item (b) on Form PEA-1.

(b1) Enter component institution's name and ID number.

(ttt) Chart of Potential Energy Savings. This information is optional; and it may be used by you to determine the energy savings potential of your buildings. The sum of all the circled weighting factors may be used for the comparison of buildings. The highest total of the weighting factors will have the highest potential for saving energy. With the assistance of a set of building construction blueprints and other personnel in the physical plant department, school district office, etc., the Auditor shall locate the appropriate "Range" of values for each of the thirteen "building characteristics" and circle the appropriate weight. Since some of the following data may not be readily available, it may be necessary in some cases to provide a best estimate based on your knowledge of the building. The following instructions apply to each numbered "building characteristics":

1.0 Refer to the value of EUI, expressed as BTU/FT^2/YR on Form PEA-2.

2.0 Total the "Occupied" or "Utilized" hours, items (j) plus (k) on Form PEA-1, and divide that value by the total annual operating hours of the HVAC system.

3.0 Add together the BTUH heating output rating of all boilers, or heat exchangers, or heating coils and the BTUH cooling rating of all chillers, or cooling coils. If building is served on a central plant add only the heat exchanger and total cooling coil capacities. The object is to obtain the actual net capacity of the heating and cooling equipment serving this building. Divide the above net total capacity by 1,000,000 to obtain the combined rated heating and cooling capacity in millions BTUH. Do not include any equipment used or designed strictly for standby service. Circle the appropriate BTUH "WF".

4.1 Determine building age category bracket and estimate remaining useful life remaining. If building has less than a 5 year life expectancy (either new or old) audits should not proceed past the PEA.

4.2 From building blueprints or estimate, determine the percent glass of the exterior building envelope wall area within the broad range of over or under 40% glass or under 15% glass. Make a judgement as to large infiltration (light wall construction without good caulking, large amount of fixed wall louvers, etc.) or low filtration (tight wall construction, good caulking, low number of wall openings). Mark only one value which best describes this building condition.

4.3 From building electrical lighting plans or estimate, determine the present building lighting load expressed as average watts per gross square foot of building area. For example, if you circle the weight "6.3" for the value, "Reduced to 3.0 w/sq. ft.", it means that you have already reduced the present building lighting load to about 3.0 w/sq. ft. and there is further potential for reducing the lighting load.

4.4 From building HVAC plans, other documents, or quick inspection, identify the predominant building HVAC system type. Many buildings have more than one single type of HVAC system. This PEA needs the predominant type information. Circle only one "WF" which applies.

4.5 From HVAC schedules on plans or other documents determine the normal design percentage of outside air for this building. This value should be an average for the building. Some building fan-coil units may have 100% O.A. and others in building may have other percentages. Estimate or calculate the average O.A. percentage for the entire building and circle the appropriate "WF".

4.6 Air distribution energy consumption is primarily a function of fan operating static pressure. If these values are not readily available, installed fan horsepower may be a good indicator. Again, consider this value on the basis of average fan conditions for the entire building. Determine either "Static Pressure" range or "Gross Sq.Ft./Fan HP" range and circle only one "WF".

FORM PEA-6

(b) Enter the building name and building identification number. Same as item (b) on Form PEA-1.

(b1) Enter component institution's name & ID number.

4.7 This is a judgement of the present operating conditions of the HVAC temperature control systems. Circle most applicable "WF".

4.8 Estimate the percentage of the building's total energy consumption which is used for base functional process loads such as lab equipment, domestic hot water, sterilizers, kilns, shop equipment, data processors, etc. Circle most applicable "WF".

4.9 This refers to the feasibility of recovering energy from "high outside air" building systems. Will indicate application for "Air Heat Recovery Wheels," "Heat Pipe Coils," or "Run-Around Cycle" coils. Circle most applicable "WF".

4.10 The functional use of the building may or may not be able to tolerate the disruptions caused by the installation of major systems retrofit projects. Encircle the most applicable "WF".

uuu Indicate the appropriate "WF" for each "ITEM" and add them to obtain a "TOTAL". The maximum possible score is 90 and the minimum possible score is 50. The higher the score, the higher the potential for saving energy in the building.

Return to: Governor's Office of Energy Resources, 7703 N. Lamar, #502, Austin, Texas 78752

(SAMPLE) PRELIMINARY ENERGY AUDIT

AUDIT DATE: (a1) 13 APRIL 1979 PAGE 1 OF 6

U.T. HEALTH SCIENCE CENTER-S.A.-002 (a) COMPONENT INSTITUTION NAME & I.D. NO. | DENTAL SCHOOL-016 (b) BUILDING OR COMPLEX NAME & ID# | 1 # OF BLDGS. | 7703 FLOYD CURL DR., SAN ANTONIO, TEXAS 78284 (c) BUILDING ADDRESS

HOSPITAL (d) CATEGORY OF BLDG. OR COMPLEX | OTHER (DENTAL) (e) BUILDING USE CATEGORY | JAMES WILLIAMSON, 7703 FLOYD CURL DR., SAN ANTONIO, TEXAS 78284 (512) 651-6639 (f) BUILDING OPERATOR NAME, ADDRESS & TELEPHONE (WORK)

UT SYSTEM, 210 W 6TH ST, AUSTIN, TEX 78701 (g) NAME AND ADDRESS OF OWNER PUBLIC (X) PRIVATE NON-PROFIT ( ) INDIAN TRIBE ( )

(jj) PEA AUDITOR NAME, ADDRESS & TELEPHONE: (WORK) GORDON C. JONES, 8031 BROADWAY, SAN ANTONIO, TEX. 78209 (512) 828-4317

I BASIC BUILDING DATA

BUILDING SIZE (h): 453,770

DATE (i) CONSTRUCTED: 1975

OPERATING SCHEDULE

DAYS	TIME PERIOD: HRS/OCCUPANTS/% GSF (j) DAYLIGHT	(k) EVE	(l) NITE
M-F	10/1400/100	4/200/50	8/25/10
SAT	10/150/75	4/25/10	8/25/10
SUN	12/25/10	4/25/10	8/25/10

(m) PARTIAL USAGE (n)

QTR	WEEKS	% GSF
1st	N.A.	—
2nd	N.A.	—
3rd	12	75
4th	N.A.	—

BASIC HVAC CONTROL DATA

CENTRAL BLDG. PANEL (q) YES — NO X

"FCMS" CONNX (s) YES X NO —

II MAJOR ENERGY USING SYSTEMS

PRIMARY HEAT SOURCE (u)	PRIMARY COOLING SOURCE (v)	SPACE TERMINAL HEAT (w)	SPACE TERMINAL COOLING (x)	DOMESTIC HOT WATER SOURCE (y)	INTERIOR LIGHTING SYSTEM (z)	SPECIAL BUILDING SYSTEMS & FACILITIES (aa)
PURCHASED STEAM	PURCHASED CHILLED WATER	DOUBLE DUCT	DOUBLE DUCT	STEAM GENERATOR STORAGE	INCAN. 5 % FLUOR. 80 % H.I.D. 15 %	(1) CHEMISTRY LABS (2) BIOLOGY LABS (3) ANIMAL RESOURCE LAB (4) OPERATING ROOMS

III UNIQUE BUILDING CHARACTERISTICS

1. YEAR ROUND, 24 HR. PER DAY OPERATION YES — NO X (bb)
2. 9 MONTH PER YEAR OPERATION YES X NO — (cc)
3. SUMMER PROGRAM USE YES X NO — (dd)
4. EVENING CLASS SCHEDULE YES X NO — (ee)
5. BUILDING HAS EXTERIOR FLOODLIGHTING YES — NO X (ff)

6. LIST YEAR & TYPE OF MAJOR BUILDING MODIFICATIONS AND ADDITIONS — TOTAL # OF MAJOR MOD. & ADD. 4 (gg)
   (1) 1976 - ADDED AC TONNAGE TO OPERATING ROOMS
   (2) 1977 - INCREASED EXHAUST AIR IN ANIMAL RESOURCE LAB
   (3) 1978 - ADDED 47,661 SQ. FT. TO FACILITY
7. OTHER: (hh) 1978 - ADDED "FCMS" CONNX TO FACILITY

FORM PEA-1 4-79 Revised 4/23/79

(SAMPLE) PRELIMINARY ENERGY AUDIT

FORM PEA-2

Capital School - 016 — (b) BUILDING NAME & I.D. NUMBER

453,770 — (h) BUILDING SIZE (GROSS SQ.FT.)

U.T.H.S.C. - S.A. - 402 — (bi) COMPONENT INSTITUTION NAME & I.D. NUMBER

IV ENERGY USE & COST DATA (ii) FOR YEAR ENDING AUG. 31, 1978 METERED ____ BEST ESTIMATE X

MONTH	ELECTRICITY KWH (jj)	ELECTRICITY COST $ (kk)	ELECTRICITY $/KWH (ll)	NATURAL GAS MCF (mm)	NATURAL GAS COST $ (nn)	NATURAL GAS $/MCF (oo)	OIL - #2 or # GAL (pp)	OIL COST $ (rr)	OIL $/GAL (ss)	PURCHASED THERMAL STEAM-HOT WATER MMBTU (tt)	PURCHASED THERMAL STEAM-HOT WATER COST $ (uu)	PURCHASED THERMAL CHILLED WATER TON HRS (vv)	PURCHASED THERMAL CHILLED WATER COST $ (ww)	TOTAL ENERGY COSTS $ (xx)
SEPTEMBER	1,001,716	28,580	.0285	13	38	2.88	N.A.	N.A.	N.A.	808	— (WW)	677,876	57,271	85,889
OCTOBER	1,085,621	31,906	.0294	26	65	2.52				1,425		395,472	49,165	81,136
NOVEMBER	1,011,890	34,060	.0337	24	59	2.42				1,936		188,814	42,573	76,712
DECEMBER	960,620	26,698	.0278	16	39	2.40				2,062		97,744	40,242	67,001
JANUARY	970,894	24,780	.0255	19	53	2.73				5,587		78,211	47,357	72,200
FEBRUARY	996,579	27,899	.0280	30	72	2.37				4,951		79,734	46,530	74,501
MARCH	989,730	27,565	.0279	25	54	2.19				3,151		191,924	50,034	77,653
APRIL	1,071,922	30,491	.0284	30	73	2.40				1,548		275,692	46,899	74,463
MAY	1,042,873	28,487	.0273	27	64	2.38				953		544,971	55,233	83,784
JUNE	1,015,445	28,003	.0276	48	118	2.46				979		633,570	58,321	86,442
JULY	1,104,457	29,971	.0270	34	154	2.57				986		688,306	61,920	91,845
AUGUST	1,039,380	27,195	.0260	63	156	2.48				1,034		695,488	61,898	89,243
ANNUAL TOTALS	(1) 12,291,146	345,547	AVG. .0281	(2) 364	944	AVG. 2.57	(3)		AVG.	(4) 25,418		(5) 4,529,357	67,379	960,865

ANNUAL ENERGY CONSUMPTION IN BTU'S: (You may round to nearest million)

(1) (yy) Electricity	12,291,146	KWH X 11,600 =	42,577,000,000 BTU
(2) (zz) Nat. Gas	364	MCF X 1,030,000 =	374,000,000 BTU
(3) (aaa) Fuel Oil #2	N.A.	GAL X 138,690 =	N.A. BTU
(4) (bbb) Fuel Oil #6	N.A.	GAL X 149,690 =	N.A. BTU
(5) (ccc1) Steam/Hot Water	25,418	MMBTU X 1,000,000 =	25,418,000,000 BTU
or			
(6) (ccc2) Steam	N.A.	LBS X 1,390 =	N.A. BTU
(7) (ddd) Chilled Water	4,529,357	TON HRS X 12,000 =	54,350,000,000 BTU
(8) (eee)	N.A.	X (fff) =	N.A. BTU
Other Fuel			
Other Fuel	N.A.	X (fff) =	N.A. BTU
		(ggg) TOTAL ANNUAL BTU'S =	222,707,000,000 BTU

ENERGY UTILIZATION INDEX (EUI)

EUI = TOTAL ANNUAL BTU'S / BUILDING GROSS SQ. FT. = BTU's/FT²/YR

EUI = (ggg) 222,707,000,000 / (h)

EUI = (hhh) 490,797 BTU's/FT²/YR

ENERGY COST INDEX (ECI)

ECI = TOTAL ANNUAL ENERGY COSTS / BUILDING GROSS SQ. FT. = $/FT²/YR

ECI = (xx) TOTAL 960,865 / (h) 453,770

ECI = (iii) $2.12 $/FT²/YR

4-79 Revised 5/1/79

(SAMPLE) PRELIMINARY ENERGY AUDIT

DENTAL School - 016
(b) BUILDING NAME & I.D. NUMBER

U.T.H.S.C. - S.A. - 402
(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

FORM PEA-3

V ENERGY CONSERVATION ACTIVITIES

1. NAME OF ENERGY MANAGER FOR BUILDING: (JJJ) JACK ARMSTRONG
2. HAS WORK WHICH PARTIALLY OR FULLY SATISFIES THE REQUIREMENTS OF AN ENERGY AUDIT ON THIS BUILDING BEEN ACCOMPLISHED PRIOR TO THIS "PEA" DATE? — YES, X NO. (kkk)
3. HAVE ANY DETAILED ENGINEERING STUDIES BEEN CONDUCTED ON THIS BUILDING OR ITS SYSTEMS PRIOR TO THIS "PEA" DATE? X YES — NO. (lll) IF "YES" NAME SYSTEMS STUDIED. (mmm) (1) HEAT RECOVERY SYS. IN ANIMAL RESOURCE LAB (2) STATIC PRESSURE BALANCING HVAC.
4. HAVE ANY ENERGY CONSERVATION MEASURES BEEN CONSIDERED OR IMPLEMENTED ON THIS BUILDING PRIOR TO THIS "PEA" DATE? X YES — NO. (nnn) IF "YES" LIST THESE MEASURES BELOW WITH ESTIMATES OF THEIR COSTS & ENERGY SAVINGS, IF AVAILABLE:

(ooo) (1) UNOCCUPIED AREA VENT. SYS. SHUT DOWN / $0.00 / 2500 MMBTU/YR
(2) BALANCED HVAC SYS. STATIC PRESS / $1200.00 / N.D.A.
(3) TIME SCHEDULING HVAC SYS. / $3500.00 / 1500 MMBTU/YR
(4) LOAD SHED PROGRAM HVAC CONTROL / $1,500.00 / 3300 MMBTU/YR
(5) ECONOMY CYCLE HVAC SYS. / $18,000.00 / 5000 MMBTU/YR

5. GENERAL AUDIT COMMENTS: (ppp) -NONE-
6. DO YOU INTEND TO CONDUCT AN "ENERGY AUDIT" OF THIS BUILDING? (rrr) YES X NO —

4-79

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(SWRE) PRELIMINARY ENERGY AUDIT PAGE 4 OF 6

DENTAL SCHOOL - 016 (b) BUILDING NAME & I.D. NUMBER

U.T.H.S.C. - S.A. - 402 (b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

FORM PEA-4 4-79

VI RENEWABLE ENERGY RESOURCE POTENTIAL

1. BUILDING LOCATION: — URBAN, X SUBURBAN, — RURAL AREA. 2. BUILDING HEIGHT: 5 STORIES.

3. IS OPEN LAND SUCH AS FIELDS, YARDS, PARKING AREAS, WHICH IS NOT HEAVILY SHADED BY TALL BUILDINGS, TREES, OR OTHER OBSTRUCTIONS AVAILABLE IN THE IMMEDIATE VICINITY OF THE BUILDING? — YES X NO.

4. IS APPROXIMATELY ONE-HALF OR MORE OF THE BUILDING'S ROOF AREA OR SOUTHERN ORIENTED WALL SURFACES HEAVILY SHADED BY TREES, SHRUBS, BUILDINGS OR OTHER OBSTRUCTIONS? — YES X NO.

5. GENERAL DESCRIPTION OF BUILDING SHAPE: — SQUARE, X RECTANGULAR, — H-SHAPED, — E-SHAPED. — T-SHAPED, — L-SHAPED, — X-SHAPED, — Y-SHAPED, — O-SHAPED.

6. ROOF DATA: X FLAT, — PITCHED. IF PITCHED, IS PITCH ORIENTED TO SOUTH? N.A. YES N.A. NO.

7. EXISTING ROOF OBSTRUCTIONS: — NONE, — CHIMNEYS, — SPACE CONDITIONING UNITS, — WATER TOWERS, X EQUIPMENT PENTHOUSES, X STAIRWELLS, — OTHER PERMANENT ROOF MOUNTED STRUCTURES.

8. SOUTH FACING WALL MATERIALS: X MASONRY, — WOOD, — ALUMINUM, — GLASS, — STEEL, — COMBINATION.

9. SOUTH FACING WALL GLASS AREA: X LESS THAN 25%, — 25-75%, — MORE THAN 75%.

10. PRIMARY SPACE HEATING SYSTEM: — OUTSIDE BUILDING, X INSIDE BUILDING; IF INSIDE BUILDING, IS IT LOCATED — IN BASEMENT, X ON GROUND FLOOR, — ON ROOF? IS INSIDE BUILDING HEATING SYSTEM OF — CENTRAL TYPE, X MULTIPLE UNITS, OR — COMBINATION OF BOTH?

11. PRIMARY DOMESTIC HOT WATER SYSTEM: — OUTSIDE BUILDING, X INSIDE BUILDING: IF INSIDE BUILDING IS IT LOCATED X IN BASEMENT, — ON GROUND FLOOR, — ON ROOF? IS INSIDE BUILDING DOMESTIC HOT WATER SYSTEM OF X CENTRAL TYPE, — MULTIPLE UNITS, OR — COMBINATION OF BOTH?

12. ARE ANY OF FOLLOWING ENERGY SOURCES AVAILABLE TO THIS IMMEDIATE BUILDING LOCATION?
(a) YEAR AROUND STEADY, CONSTANT WIND VELOCITIES, 10 MPH MINIMUM — YES X NO. (b) NATURAL WATER STREAM OF MINIMUM 10 FOOT HEAD, CONSTANT YEAR AROUND FLOW — YES X NO. (c) NATURAL HOT GROUND WATER WELLS (GEOTHERMAL WELLS) — YES X NO. (d) SEACOAST TIDES OF 8 FOOT OR GREATER — YES X NO. (e) SOURCE OF LOW COST FOREST TIMBER BY-PRODUCTS — YES X NO. (f) ANY OTHER RENEWABLE ENERGY SOURCE — YES X NO; IF YES, DESCRIBE N.A.

OPTIONAL

(This Chart is required with TA application for unmetered buildings)

(SAMPLE) PRELIMINARY ENERGY AUDIT

DENTAL SCHOOL - 016
(b) BUILDING NAME & I.D. NUMBER

U.T.H.S.C. - SA - 402
(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

FORM PEA-5 4-79 Revised 5/1/79

VII BUILDING ENERGY SAVING POTENTIAL

(ttt) CHART OF POTENTIAL ENERGY SAVINGS

1.0 ANNUAL ENERGY USE: (SEE EUI PAGE PEA-2)

BTU/SQ.FT./YR.	WF
400,000 AND ABOVE	(9)
300,000 TO 400,000	8
200,000 TO 300,000	7
100,000 TO 200,000	6
LESS THAN 100,000	5

2.0 RATIO OF OCCUPANCY/SPACE UTILIZATION HOURS TO HVAC EQUIPMENT OPERATING HOURS:

OCCUPANCY/UTILIZATION HRS. / HVAC OPERATING HOURS = RATIO

RATIO	
UNDER 0.20	14.4
0.2 TO 0.4	12.8
0.4 TO 0.6	(11.2)
0.6 TO 0.8	9.6
0.8 TO 1.0	8.0

3.0 RATED CAPACITY OF HEATING & COOLING EQUIPMENT:

COMBINED HVAC CAPACITY IN BTUH X 10^6

40 AND ABOVE	(9)
25 TO 40	8
15 TO 25	7
5 TO 15	6
BELOW 5	5

BUILDING MODIFICATION POTENTIAL:

4.1 BUILDING AGE & REMAINING LIFE (R.L.)

	WF
NEW (1-5 YRS) OVER 40 YR. R.L.	(3.6)
NEW (1-5 YRS) UNDER 40 YR. R.L.	3.2
RECENT (5-15 YRS) OVER 40 YR. R.L.	2.8
RECENT (5-15 YRS) UNDER 40 YR. R.L.	2.4
OLD (OVER 15 YRS)	2.0
OLD (OVER 15 YRS) LESS THAN 5 YR. R.L.	0.0

4.2 TOTAL WALL AREA PERCENT GLASS & INFILTRATION:

% GLASS RANGE	
OVER 40% GLASS	4.5
LARGE INFILTRATION	4.0
UNDER 40% GLASS	3.5
LOW INFILTRATION	3.0
UNDER 15% GLASS	(2.5)

4.3 LIGHTING LEVELS POTENTIAL REDUCTION:

RANGE	
REDUCED TO 3.0 W/SQ.FT.	6.3
REDUCED TO 2.0 - 3.0 W/SQ.FT.	(5.6)
REDUCED TO 1.0 - 2.0 W/SQ.FT.	4.9
CAN REDUCE BY SWITCHING CHANGES	4.2
LIGHTING LEVELS CANNOT BE REDUCED	3.5

4.4 PREDOMINANT HVAC SYSTEM:

TYPE	WF
DUAL DUCT OR REHEAT	(12.6)
MULTIZONE OR INDUCTION UNITS	11.2
ROOFTOP, PACKAGED WALL UNITS, OR UNIT VENTILATION	9.8
FAN-COIL, VAV, OR HEAT/VENT ONLY UNIT	8.4
RADIATION, UNIT HEATERS (NO FAN SYS.)	7.0

4.5 NORMAL OUTSIDE AIR SUPPLY PERCENTAGE:

RANGE	WF
75 TO 100%	(8.1)
50 TO 75%	7.2
25 TO 50%	6.3
10 TO 25%	5.4
INFILTRATION ONLY WITH TOILET EXHAUST	4.5

4.6 FAN ENERGY:

FAN STATIC PRESS.	GROSS BLDG. SQ.FT./FAN HP	WF
10" OR ABOVE	≤ 200 SQ.FT./HP	5.4
8" SP TO 10" SP	≤ 600 SQ.FT./HP	4.8
6" SP TO 8" SP	≤1000 SQ.FT./HP	4.2
4" SP TO 6" SP	≤1500 SQ.FT./HP	(3.6)
UNDER 4" SP	≤2000 SQ.FT./HP	3.0

OPTIONAL

(This Chart is required with TA application for unmetered buildings)

(SAMPLE) PRELIMINARY ENERGY AUDIT

FORM PEA-6 4-79 Revised 5/1/79

DENTAL SCHOOL - 016
(b) BUILDING NAME & I.D. NUMBER

U.T.H.S.C. - SA - 402
(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

VII BUILDING ENERGY SAVING POTENTIAL (CONT'D)

CHART OF POTENTIAL ENERGY SAVINGS (Continued)

4.7 HVAC CONTROL SYSTEM:

CONDITION	WF
OUTSIDE AIR & RELIEF DAMPERS HANG OPEN	5.4
INOPERATIVE CONTROLS	4.8
NO WRITTEN PREVENTIVE MAINT. PROGRAM	4.2
CONTROLS ARE SERVICED REGULARLY	(3.6)
CONTROLS UNDER MAINTENANCE CONTRACT	3.0

4.8 BUILDING PROCESS ENERGY BASE LOAD:

% OF TOTAL LOAD	WF
20% BASE LOAD - COULD REDUCE	2.7
15% BASE LOAD - COULD REDUCE	(2.4)
10% BASE LOAD - COULD REDUCE	2.1
5% BASE LOAD - COULD REDUCE	1.8
NO REDUCTION OF BASE LOADS POSSIBLE	1.5

4.9 HVAC HEAT RECOVERY:

RANGE	WF
100% O.A., RECOVERY FEASIBLE	4.5
75% O.A., RECOVERY FEASIBLE	4.0
50% O.A., RECOVERY FEASIBLE	3.5
100% O.A., RECOVERY DIFFICULT	(3.0)
HEAT RECOVERY NOT FEASIBLE	2.5

4.10 USER RETROFIT TOLERANCE:

RANGE	WF
USER CAN TOLERATE MAJOR RETROFIT	4.5
USER CAN TOLERATE MINOR RETORFIT	(3.5)
USER CANNOT TOLERATE ANY DISRUPTIONS	2.5

ENERGY SAVING POTENTIAL TABULATION (uuu)

ITEM	WF
1.0 ANNUAL ENERGY USE	9.0
2.0 RATIO UTILIZ. HRS. TO OPER. HRS.	11.2
3.0 RATED CAP. OF HVAC EQUIP.	9.2
4.1 BUILDING AGE & LIFE EXPECT.	3.6
4.2 PERCENT GLASS & INFILTRATION	2.5
4.3 LIGHTING LEVELS	5.6
4.4 HVAC SYSTEM TYPE	12.6
4.5 OUTSIDE AIR RATIO	8.1
4.6 FAN ENERGY	3.6
4.7 HVAC CONTROL SYSTEM	3.6
4.8 BUILDING BASE LOAD	2.4
4.9 HVAC HEAT RECOVERY	3.0
4.10 USER RETROFIT TOLERANCE	3.5
TOTAL	77.7

165

166

4/23/79
Revised

ENERGY AUDIT PROCEDURES

The purpose of the Energy Audit (EA) is to provide a survey of the building audited which:

(1) Identifies the type, size, energy use level and major energy using systems;

(2) Determines appropriate energy conservation maintenance and operating procedures; and

(3) Indicates the need, if any, for the acquisition and installation of energy conservation measures.

These forms; EA-1, EA-2, EA-3, and EA-4, are designed to gather this basic information with a minimum of on-site effort. The EA Auditor will complete these forms by working with the Component Institution's Physical Plant Department, the Component Institution's Energy Manager, and by visual observation of the building or complex.

The numerical entries are to be obtained from Component Institution's records, Component Institution's best estimates, and by simple mathematical multiplication and division operations. All EA Form entry blanks must have an entry. Entries to be noted as follows:

"RD" - Record Data
"BE" - Best Estimate
"NDA" - No Data Available
"NA" - Not Applicable to This Building

Draw a straight horizontal line through spaces or blanks not used to indicate that the blank or space was not overlooked. All check marks will be made with an "X" indicating positive response to question.

The following procedures provide instructions for completing the EA Forms: The small case alphabet letters in parentheses key to the form entry data. All addresses called for to be complete, current street addresses including ZIP code. Provide telephone numbers if available.

Forms EA-1, EA-2, EA-3, and EA-4, dated 4/79 are designed to meet requirements of Federal Register dated April 2, 1979, Vol. 44, No. 64, paragraph 450.43.

As the Forms PEA-1, PEA-2, PEA-3, and PEA-4 are requirements of the Energy Audit, they must be attached to the Energy Audit Forms. The Energy Audit (EA) Forms and Preliminary Energy Audit (PEA) Forms must be attached to any applications for Technical Assistance (TA) submitted to the Governor's Office of Energy Resources at 7703 N. Lamar, Room 502, Austin, Texas 78752. Please designate the contents of any envelope submitted to the Governor's Office of Energy Resources by bold printing the appropriate letters, "PEA, EA, TA" in the bottom right corner of the envelope.

FORM EA-1 INSTRUCTIONS

(a) Enter the calendar date on which the EA is completed.

(b) Enter the Building or Complex Name and Identification Number as provided by the owner. Indicate whether the report covers a single building or a complex by circling the appropriate term. If complex, indicate the number of buildings in the complex.

(b1) Enter Component Institution's Name and I.D. Number. The Component Institution should be the same as identified on the PEA forms.

(c) Enter Building Size expressed in gross square feet as measured from the outside perimeter of the building, excluding major areas which are neither heated nor cooled such as attached parking garages.

(c1) Enter name and street address of "Owner."

(d) thru
(f1) Place an "X" in these blank spaces upon completion of Forms PEA-1, PEA-2, PEA-3, PEA-4, PEA-5, and PEA-6.

(g) Enter general description of planned changes for the next fifteen years such as "building to be demolished in 3 years," "major rehabilitation planned," "change from classroom use to dormitory use," "change from teaching space to office space," etc.

(h) thru
(x) On this form to be completed only for buildings over 200,000 gross square feet in size. Enter "N.A." in all blank spaces if building is less than 200,000 square feet gross area.

(h) Enter annual peak electrical demand in KW, if available. Enter "NDA" if data is not available.

(h1) Enter months during annual period when monthly peak electrical demand within $\pm$ 10% of maximum demand occurs. Enter "NDA" if data is not available.

(j) Enter days of weekly cycle (Mon., Tues., etc.) when peak electric demand occurs. Enter "NDA" if data is not available.

(k) Enter hour of day (9:00 a.m., 2:30 p.m., etc.) when peak electric demand occurs. Enter "NDA" if data is not available.

(l) Enter name of the major mechanical or electrical building systems such as "HVAC," "Food Prep.," "Data Processing," "Lighting," "Elec. Htg.," etc.

(m) Enter electrical KWH consumption, if applicable, of the major systems entered in (l) above.

(n) Convert KWH to BTU by use of conversion factor in (x) below and enter value in table.

FORM EA-1 INSTRUCTIONS (continued)

(o) Enter "MCF" natural gas consumption, if applicable, of the major systems entered in (l) above.

(p) Convert MCF to BTU by use of conversion factor in (x) below and enter value in table.

(r) Enter "Gallons" of fuel oil (note Fuel Oil Grade if different from #2 grade) consumption, if applicable, of the major systems entered in (l) above.

(s) Convert "Gal" to BTU by use of conversion factor in (x) below and enter value in table.

(t) Enter "BTU value" of Steam/Hot Water (strike through inapplicable energy source) consumption, if used, by the major systems entered in (l) above. If metered on MMBTU unit basis, convert MMBTU to BTU by use of conversion factor in (x) below and enter value in table.

(u) Enter "Ton-Hours" of chilled water consumption, if applicable, of the major systems entered in (l) above.

(v) Convert "Ton-Hours" to BTU by use of conversion factor in (x) below and enter value in table.

(w) Enter the total of BTU values developed in (n), (p), (s), (t), and (v).

(x) BTU conversion factor table for use in determining above table entries. These blanks are to be used to convert only the values for table 2.2 above or other major energy fuel types and are not intended to account for entire building consumption. If major fuel types other than those mentioned in table 2.2 above are used, cross out the unused fuel types and insert the appropriate fuel types.

3.0

(y) Describe general building conditions, such as age and condition of lighting fixtures, building envelope and window condition, equipment repair and condition, piping and electrical feeder conditions, thermal insulation condition, etc.

FORM EA-2 INSTRUCTIONS

(b) Enter the Building or Complex Name and Identification Number.

(b1) Enter Component Institution's Name and I.D. Number.

(c) Enter building size expressed in gross square feet as measured from the outside perimeter of the building, excluding areas which are neither heated nor cooled.

(4.1)&(4.2)&(4.3)B Enter average annual heating degree days and cooling degree days, and average monthly wind velocity in mph taken from 1978 Annual Summary of Climatological Data for the geographic location of the building as published by the National Oceanic and Atmospheric Administration, National Weather Service. See Appendix for data.

(4.3)A Enter Average Solar Insolation by month for nearest reporting city to building being audited. Obtain copy of "Input Data for Solar Systems" by Cinquemani, Owenby & Baldwin, published by the National Climatic Center, 1978, National Weather Service, Asheville, N.C. See Appendix for additional data.

(z) thru
(ff) The purpose of this data is to illustrate, if possible, the percentage reduction in energy consumption in this building due to changes in maintenance and operating procedures which have been implemented in the past. It is intended that the reduced energy consumption be a result of changes in maintenance and operating procedures and not as a result of weather variances, retrofit actions, or changes in occupancy patterns. If it can be illustrated that energy consumption (BTU/SQ.FT.) has been reduced by not less than 20 percent from a base year in the past to a subsequent year, then it will not be necessary to conduct an on-site energy audit identifying further maintenance and operating procedures; otherwise, an on-site energy audit is required. However, the maintenance and operating procedures which were implemented and resulted in the 20 percent or greater reduction in energy consumption must be listed in (gg) below; if additional space is required beyond the space provided in (gg), attach additional pages. If (11), "% REDUCTION FROM BASE YEAR" is 20% or greater, it is not necessary to complete Form EA-3 except for instruction (gg) on following page; instead, you may proceed to complete Form EA-4. If an on-site audit is not conducted because of a past 20% or greater energy reduction, it is highly likely that an on-site review of the building's utility billings, occupancy records, and past retrofit actions will be a part of the sample followup review process required of the Governor's Office of Energy Resources by Federal rules.

(z) Enter fiscal years applicable to data entered in table. The last year in the table should be the most recent full year. The first year in the table should be the Base Year from which the energy reduction is measured. The Base Year would be the year just prior to the maintenance and operating procedures changes you are identifying as the cause for the energy reduction. The second

FORM EA-2 INSTRUCTIONS (continued)

fiscal year entry will be the Comparison Year which must be a year subsequent to the Base Year. Also, there must be a variance of less than 10 percent between the total number of annual degree days (heating plus cooling) of the Comparison Year and the total annual degree days of the Base Year. The Last Full Year may also be used as the Comparison Year. Enter the total degree days for each appropriate fiscal year in the same entry space just below the fiscal year to which it relates.

(aa) thru
(dd) If major fuel types other than those listed in (aa) through (dd) are used, cross out the unused fuel types and insert the appropriate fuel types. The conversion factors used on page EA-1, table(x), should be used for calculcting the BTU for each fiscal year.

(aa) Enter Annual Total electrical KWH consumption. Convert to BTU value using table(x) on Form EA-1. Enter BTU value.

(bb) Enter Annual Total natural gas MCF consumption. Convert to BTU value using table(x) on Form EA-1. Enter BTU value.

(cc) Enter Annual Total gallons of oil consumption. Convert to BTU value using table(x) on Form EA-1. Enter BTU value. Note fuel oil number if different than number 2 grade.

(dd) Enter Annual Total of Central Plant Thermal energy consumption. Convert to BTU value using table(x) on Form EA-1. Enter BTU value. If you are metered on MMBTU basis, remember to convert to BTU before entering the value on (dd).

(ee) Calculate total BTU per Gross Square Foot values for each fiscal year. Divide total BTU (ff) by Building Size (c), and enter at (ee).

(ff) Enter total BTU consumption as total of all horizontal entries for BTU for each fiscal year.

(gg) Enter brief description of "Maintenance Procedures" and "Operating Procedures" changes implemented during the above time span between the Base Year and the Comparison Year. Place small "✓" to left of each M & O change on Form EA-3 which has already been implemented on this building.

(hh) Enter the BTU per square foot (ee) for the Base Year.

(jj) Enter the lesser BTU per square foot (ee) of either the Comparison Year or the Last FullYear.

(kk) Subtract (jj) from (hh) and enter this value in both blanks marked (kk).

(ll) Enter (kk) divided by (hh) and place this value in blank (ll), % Reduction from Base Year.

FORM EA-3 INSTRUCTIONS

(b) Enter the Building or Complex Name and Identification Number.

(b1) Enter Component Institution's Name & I.D. Number.

(c) Enter Building Size expressed in gross square feet as measured from the outside perimeter of the building, excluding major space which is neither heated nor cooled.

Note: Part III, Blanks (mm) through (aaa) are to be completed only if the value of (ll), Form EA-2 is less than 0.20.

(mm) Indicate whether or not you recommend and support the established preventative maintenance plan by checking "Yes" or "No".

(nn) Indicate whether or not there is a scheduled preventative maintenance plan for the building by checking "Yes" or "No".

(oo) (rr) (tt) (vv) (xx) (zz) Circle the appropriate "VALUES" for percent of energy savings related to each "system change" recommended in the left-hand column. Total all circled "VALUES" for each category (e.g. VENTILATION SYSTEM OPERATION) and enter in the appropriate Subtotal line, oo, rr, tt, vv, xx, and zz.

(pp) (ss) (uu) (ww) (yy) (aaa) Enter Auditor's best estimate of the range of annual energy cost savings which could be realized if all of the listed "system changes" are implemented for this building. Enter the total of estimated cost savings in (pp) through (aaa) of each system change which was circled. This should be expressed as a range such as "2-6%", "8-12%", etc. The % cost will vary somewhat from % energy savings in that % cost will depend on which energy source is affected by the "system changes." That is, an electrical energy intensive savings will result in a greater cost savings than a natural gas energy savings change.

(zz) & (aaa) are applicable to Auditor's Entries of "Other" Maintenance and Operating Procedures.

NOTE: The primary purpose of the on-site energy audit is to identify maintenance and operating procedures which may be used to reduce energy consumption. All specific recommended maintenance and operating procedures changes relating to the System Changes on Form EA-3 which are to be initiated in this building or complex for the purpose of reducing energy consumption are to be recorded and kept on file at the institution for the purpose of establishing and monitoring an effective energy maintenance and operating procedures program.

FORM EA-4 INSTRUCTIONS

NOTE: Form EA-4, including Parts IV & V, is to be completed for all buildings regardless of identification of previous reductions in energy consumption.

(b) Enter the Building or Complex Name and Identification Number.

(b1) Enter Component Institution's Name and I.D. Number.

(c) Enter the Building Size expressed in gross square feet. Same as (c) on Form EA-1.

(bbb) Enter value of Annual BTU per gross square foot taken from entry (hhh), E.U.I., on Form PEA-2.

(ccc) Enter value of Annual Energy Cost per gross square foot taken from entry (iii), E.C.I., on Form PEA-2.

(ddd) Enter brief description of the physical condition of the Building Envelope. Such as "bad caulking & sealant condition;" "good tight construction;" "new, 3 yrs. old;" "single glaze, clear windows;" "needs masonry repainting;" "louvers in bad shape;" etc.

(eee) Enter brief description of the physical condition of the Building Energy Using Systems. Such as "thermal insulation in bad condition;" "pump seals are leaking;" "controls are malfunctioning;" "hot water generator needs replacement;" "controls are outdated;" "electrical switchgear is marginal;" "electrical service entrance is too small;" etc.

(fff) Auditor to enter brief description of his/her opinion as to need and potential for retrofit. Such as "large window areas could produce savings with new double glazing;" "temperature control system should be replaced;" "building is a good candidate for 100% O.A. economizer cycle retrofit;" "lighting system retrofit would reduce wattage input and increase lighting efficiency;" "the above E.U.I. is excessive for this building category, retrofit to reduce same;" "the above E.C.I. is below average for this building category - first level retrofit would not be cost effective;" etc.

3.0 Auditor to indicate "yes" or "no" whether or not the particular building site, building construction, existing equipment location, type of mechanical systems, etc., present an opportunity for solar system application to the building heating or cooling or domestic hot water systems.

FORM EA-4 INSTRUCTIONS (continued)

(ggg) Auditor is to select the most obvious, cost effective, energy conservation retrofit project and enter description of same here.

(hhh) Enter an estimate of installed cost of ECP noted in (ggg) above.

(iii) Enter an estimate of annual energy cost savings which would result from the installation of the ECP noted in (ggg) above.

(jjj) Enter the mathematical dividend of (hhh), cost, divided by (iii), savings per year.

Please return to Governor's Office of Energy Resources, 7703 N. Lamar, #502, Austin, Texas 78752. **ENERGY AUDIT** PAGE 1 OF 4

Energy Auditor Certification: I hereby certify that I, JOHN DOE (name of auditor), have participated fully in the Energy Auditor Training Program developed by the Governor's Office of Energy Resources conducted at UT-AUSTIN (address of training site) by UNIVERSITY OF TEXAS-JOHN ALLAN (Sponsoring Agency-Instructor) on MAY 7 & 8, 1979 (date), or in lieu of attending the training session, have completed — (# of classroom hrs) hours of educational courses and/or on-the-job experience in analyzing and/or operating the mechanical and electrical and other energy using systems of the type of building or complex being audited. I have attached a copy of official educational transcripts and/or resumes of previous applicable work experience including the address and telephone numbers of such employers if I have claimed past education and/or work experience in lieu of attending the official training program. I further certify that I am not responsible for the day-to-day operations of the building and that a full disclosure of any financial interest which I might have relating to this energy audit or any energy conservation measure is attached hereto. I also certify that the energy audit was conducted in accordance with the requirements set forth under 10 CFR Part 450, paragraph 450.43 of the regulation which was published in the Federal Register dated April 2, 1979.

(SAMPLE) John Doe — Signature of Energy Auditor | 072-38-0688 — Social Security No. of Energy Auditor | UT San Antonio — Organization of Auditor | (a) 12 May, 1979 — Date

(b) JOHN PEACE LIBRARY-082 — BUILDING OR COMPLEX NAME & PD NUMBER | 1 — # OF BLDGS | (c) 225,870 — BUILDING SIZE (GROSS SQ.FT.)

(b1) UT-SAN ANTONIO-401 — COMPONENT INSTITUTION NAME & I.D. NUMBER

FOLLOWING PEA FORMS COMPLETED ATTACHED HERETO:

(d) X PEA-1, (d1) X PEA-2, (e) X PEA-3, (e1) X PEA-4, (f) X PEA-5, (f1) X PEA-6

UNIVERSITY OF TEXAS SYS, 210 W. 6TH ST., AUSTIN, TX 78701 — NAME AND ADDRESS OF OWNER

THE CONTENT OF THIS AUDIT FORM IS DESIGNED TO MEET THE REQUIREMENTS OF FEDERAL REGISTER, APRIL 2, 1979. VOL. 44, No. 64, PARA. 450.43

FORM EA-1 4/79 Revised 4/23/79 Revised 5/1/79

I DESCRIPTIVE BUILDING DATA

1.0 LIST MAJOR CHANGES IN "FUNCTIONAL USE" OR "MODE OF OPERATION" PLANNED FOR NEXT 15 YEARS:

(g) CONVERT ONE-HALF OF FLOOR SPACE TO CLASSROOMS WITHIN NEXT FIVE YEARS

2.0 FOR BUILDINGS OVER 200,000 GROSS SQUARE FEET AREA, PROVIDE THE FOLLOWING FROM AVAILABLE DATA (AD) OR BY REASONABLE ESTIMATE (BE) IDENTIFY SOURCE IN ALL BLANKS.

2.1 PEAK ELECTRICAL DEMAND IN KW: (h) 461 KW

MONTHS (h1) JUNE, JULY, AUGUST, DAY (j) TUES, WED, THURS,

HOUR OF DAY (k) 4:30 PM, —, —.

2.2 PROVIDE BELOW THE ANNUAL ENERGY USE OF THE MAJOR BUILDING SYSTEM BY FUEL TYPE:

3.0 GENERAL BUILDING & SYSTEMS CONDITION:

(y) BUILDING IS THREE YEARS OLD AND IS IN EXCELLENT CONDITION

MAJOR SYSTEM (l)	ELECTRICITY KWH (m)	ELECTRICITY BTU (n)	NATURAL GAS MCF (o)	NATURAL GAS BTU (p)	#2 OIL GAL (r)	#2 OIL BTU (s)	CENTRAL PLANT THERMAL STEAM-HOT WATER (t) BTU	CENTRAL PLANT THERMAL CHILLED WATER TON HRS. (u)	CENTRAL PLANT THERMAL CHILLED WATER BTU (v)	TOTAL BTU (w)
HVAC	3,062,777	35,528,000,000	N.A.	N.A.	N.A.	N.A.	14,130,000,000	3,248,575	38,983,000,000	88,641,000,000
LIGHTING	1,814,350	21,026,000,000	N.A.	N.A.	N.A.	N.A.	—	—	—	21,026,000,000

BTU CONVERSION FACTORS (x) (You may round to nearest million.)

ELEC.	3,062,777	KWH x 11,600 =	35,528,000,000	BTU	STEAM/HW	14,130	MMBTU x 1,000,000 =	14,130,000,000	BTU
NAT.GAS.	N.A.	MCF x 1,030,000 =	N.A.	BTU	STEAM	N.A.	LBS x 1,390 =	N.A.	BTU
OIL #2	N.A.	GAL x 138,690 =	N.A.	BTU	CH.WATER	3,248,575	TON HR x 12,000 =	38,983,000,000	BTU
OIL #6	N.A.	GAL x 149,690 =	N.A.	BTU	OTHER		x =		BTU
					OTHER		x =		BTU

(SAMPLE)

ENERGY AUDIT

FORM EA-2 4-79 REVISED 4-23-79

(b) JOHN PEACE LIBRARY - 0582 — BUILDING NAME OR COMPLEX & ID NUMBER

(c) 225,870 — BUILDING SIZE (GROSS SQ. FT.)

(b1) U.T. SAN ANTONIO - 401 — COMPONENT INSTITUTION NAME & I.D. NUMBER

I DESCRIPTIVE BUILDING DATA (CONTINUED)

4.0 CLIMATIC FACTORS:

4.1 AVERAGE ANNUAL HEATING DEGREE DAYS 1570

4.2 AVERAGE ANNUAL COOLING DEGREE DAYS 2774

4.3 AVERAGE MONTHLY SOLAR INSOLATION, HORIZONTAL SURFACES IN BTU/SQ.FOOT AND WIND VELOCITY IN MPH

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SOLAR (A)	27,758	32,313	44,950	48,369	58,731	62,070	65,753	60,361	47,139	41,139	41,853	26,261
WIND VEL.(B)	9.1	9.8	10.5	10.6	10.1	10.1	9.1	8.5	8.5	8.5	8.4	8.6

5.0 ROOF CHARACTERISTICS:

5.1 PRIMARY STRUCTURAL COMPONENT: — STEEL, — WOOD, X REINF. CONC., — OTHER, SPECIFY —

5.2 ROOF SURFACE: X BUILT UP, — SLATE, — TILE, — WOOD SHINGLES, — COMP. SHINGLES, — OTHER —

II ENERGY CONSERVATION MAINTENANCE & OPERATION PROCEDURES

1.0 COMPLETE FOLLOWING TABLE USING ANNUAL TOTALS FOR FISCAL YEARS ENTERED, CONVERSION FACTORS LISTED ON FORM EA-1, & TOTALS OF BTU CONSUMPTION PER YEAR. ALL FIGURES BELOW ARE "BEST ESTIMATES"

FISCAL YEAR (z)	ELECTRICITY (aa) KWH	ELECTRICITY (aa) BTU	NATURAL GAS (bb) MCF	NATURAL GAS (bb) BTU	#2 OIL (cc) GAL	#2 OIL (cc) BTU	CENTRAL PLANT THERMAL (dd) STEAM-HOT WATER MMBTU/BTU	CHILLED WATER TON HRS.	CHILLED WATER BTU	(ee)	TOTAL BTU/GROSS SQ. FT. (ff) TOTAL BTU
BASE YEAR 1975-76	6,121,758	XXX	66.6	XXX	N.A.	XXX	XXXXX	3,391,866	XXX	(ee)	565,982
(M) 1996 (C) 2160	XXX	70,015	XXX	68.6	XXX	N.A.	17,064 BTU	XXX	40,702	(ff)	$127,850 \times 10^6$
COMPARISON YR. 1976-77 (M) 2058 (C) 2990	5,603,667	XXX	60.1	XXX	N.A.	XXX	XXXXX	3,366,781	XXX	(ee)	536,323
	XXX	65,003	XXX	62.0	XXX	N.A.	15,694 BTU	XXX	40,401	(ff)	$121,150 \times 10^6$
LAST FULL YR 1977-78 (M) 2056 (C) 3003	5,189,100	XXX	55.1	XXX	N.A.	XXX	XXXXX	3,248,575	XXX	(ee)	501,801
	XXX	60,182	XXX	56.8	XXX	N.A.	14,130 BTU	XXX	38,983	(ff)	$113,352 \times 10^6$

2.0 LIST OF MAINTENANCE PROCEDURES AND OPERATING PROCEDURES WHICH HAVE BEEN IMPLEMENTED OVER ABOVE TIME SPAN OF YEARS TO REDUCE ENERGY CONSUMPTION.

(gg) (1) REDUCE VENTILATION RATE (2) UNOCCUPIED AREA VENT SHUT DOWN (3) REPAIR OF CAULKING & WEATHER-STRIPPING (4) CONTROLS MAINT. & REPAIR (5) CHANGE THERMOSTAT SET POINTS (6) PUT LOCK COVERS ON STATS (7) RESET HOT & HEAD TEMP. (8) REDUCE DOM. H.W. TEMP. (9) REPAIR LEAKS

(BASE YEAR: BTU/SQ. FT.) (hh) 565,982 − (LESSER COMPARISON YEAR: BTU/SQ. FT.) (jj) 501,801 = (kk) 64,181 BTU/SQ. FT. REDUCTION

(kk) 64,181 BTU/SQ. FT. REDUCTION ÷ (hh) 565,982 BASE YEAR: BTU/SQ. FT. = (ll) 11.3 % REDUCTION FROM BASE YEAR

(SAMPLE) ENERGY AUDIT

(b) JOHN PEACE LIBRARY-0542 BUILDING OR COMPLEX NAME & I.D NUMBER

(c) 225,890 BUILDING SIZE (GROSS SQ. FT.)

(b1) U.T. SAN ANTONIO - 401 COMPONENT INSTITUTION NAME & I.D. NUMBER

III RECOMMENDED ENERGY CONSERVATION MAINTENANCE & OPERATION PROCEDURES

PROVIDE FOLLOWING RECOMMENDATIONS BASED ON AN ON-SITE INSPECTION OF BUILDING:

1. SCHEDULED PREVENTIVE MAINTENANCE PLAN. RECOMMEND (mm) X YES — NO; IN EXISTENCE (nn) X YES — NO

2. PROVIDE A GENERAL ESTIMATE, EXPRESSED AS A RANGE, OF ANNUAL ENERGY SAVINGS & ANNUAL ENERGY COST SAVINGS WHICH COULD RESULT FROM IMPLEMENTING THE FOLLOWING MAINTENANCE & OPERATING PROCEDURES.

SYSTEM CHANGES	VALUES	% ENERGY	% COST
VENTILATION SYSTEM OPERATION	% SUB-TOTAL	1.0 (oo)	0.5 (pp)
REDUCED VENTILATION	2.0		
VARIABLE VENTILATION	1.0		
UNOCCUPIED AREA VENTILATION SHUT DOWN	0.5		
REPAIR OF CAULKING & WEATHER STRIPPING	0.5		
MAINTENANCE & REPAIR OF OPERATING CONTROLS	1.0		
HEATING & COOLING SYSTEM OPERATION	SUB-TOTAL	3.0 (rr)	1.0 (ss)
CHANGE IN THERMOSTAT CONTROL SET POINTS	2.0		
PROVIDE LOCKING THERMOSTAT COVERS	1.0		
RESET OF AIR & WATER TEMPERATURES	2.0		
UNOCCUPIED RESET OR SHUT DOWN OF SYSTEM	2.0		
SHUT DOWN NON-CRITICAL EXHAUST SYSTEMS	1.0		
LIGHTING SYSTEMS OPERATING	SUB-TOTAL	5.0 (tt)	7.0 (uu)
REDUCE ILLUMINATION LEVELS	3.0		
MAXIMIZE USE OF DAYLIGHT	1.0		
INSTALL HIGH EFFICIENCY LAMPS	1.0		
REDUCE OR DELETE EVENING CLEANING HOURS	2.0		

SYSTEM CHANGES	VALUES	% ENERGY	% COST
WATER SYSTEMS OPERATIONS	% SUB-TOTAL	1.5 (vv)	0.5 (ww)
REPAIR ALL LEAKS	0.5		
REDUCTION OF WATER CONSUMPTION (FLOW RESTRICTION)	0.5		
REDUCE HOT WATER TEMPERATURE	1.0		
INCREASE CHILLED WATER TEMPERATURE	1.0		
UTILITY PLANT & DISTRIBUTION SYSTEM OPERATION	SUB-TOTAL	3.5 (xx)	1.0 (yy)
EQUIPMENT CLEANING	0.5		
ADJUSTMENT OF AIR/FUEL RATIO	0.5		
COMBUSTION MONITORING & CONTROL	0.5		
ADJUSTMENT OF DRIVES, FANS, MOTORS, ETC.	1.0		
STEAM TRAP MAINTENANCE	1.5		
PIPE INSULATION REPAIR	1.0		
OTHER MAINTENANCE & OPERATION PROCEDURES	SUB-TOTAL	(zz)	(aaa)
TOTALS		14	10

EA-3 REVISED 4-23-79

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(SAMPLE)

ENERGY AUDIT

(b) JOHN PEACE LIBRARY - 0542 — BUILDING OR COMPLEX NAME & ID NUMBER

(c) 225,890 — BUILDING SIZE (GROSS SQ. FT.)

(b1) U.T. SAN ANTONIO - 401 — COMPONENT INSTITUTION NAME & I.D. NUMBER

IV ENERGY CONSERVATION RETROFIT RECOMMENDATIONS

1.0 BASIC BUILDING DATA: 1.1 ANNUAL ENERGY USE (bbb) 50,801 BTU/GROSS SQ. FT. PER YEAR

1.2 ANNUAL ENERGY COST (ccc) $2.51 $/GROSS SQ. FT. PER YEAR

1.3 DESCRIBE PHYSICAL CONDITION OF BUILDING ENVELOPE: (ddd) BUILDING IS 3 YEARS OLD - OVERALL CONDITION IS EXCELLENT

1.4 DESCRIBE PHYSICAL CONDITION OF BUILDING ENERGY USING SYSTEMS: (eee) GOOD OPERATIONAL CONDITION

2.0 BASED ON 1.1, 1.2, 1.3, AND/OR 1.4 ABOVE INDICATE THE NEED & POTENTIAL FOR ENERGY CONSERVATION RETROFIT IMPLEMENTATION. BRIEFLY OUTLINE RECOMMENDED RETROFIT OPTIONS:

(fff)(1) PROVIDE SEPARATE H/C UNIT FOR DATA PROCESSOR AREA & SHUT DOWN LARGE AIR HANDLING SYS. FOR EVE. & NITE HRS. (2) PROVIDE 100% O.A. NIGHT CYCLES, (3) DOUBLE GLAZING OF WINDOWS

3.0 BASED ON DATA NOTED IN SECTION VI, FORM PEA-4 & ITEMS 4.0 & 5.0, FORM EA-2 THE AUDITOR SHALL INDICATE WHETHER OR NOT THE BUILDING CONDITIONS AND/OR SITE CHARACTERISTICS PRESENT AN OPPORTUNITY TO APPLY SOLAR HEATING AND/OR COOLING SYSTEMS, OR SOLAR DOMESTIC HOT WATER HEATING SYSTEMS. — YES, X NO

V ENERGY CONSERVATION RETROFIT ASSESSMENT

1.0 DESCRIBE PROPOSED ENERGY CONSERVATION PROCEDURE (ECP): (ggg) PROVIDE SMALL H/C UNIT FOR THE DATA PROCESSOR CENTER TO BE UTILIZED AFTER NORMAL SCHOOL HOURS, WEEK-ENDS & HOLIDAYS. THUS AVOIDING NEED FOR 24-HR OPERATION OF A 200 H.P. AIR HANDLER SYS. & A 75 H.P. CH. W. PUMP

2.0 ESTIMATE OF INSTALLED COST OF ABOVE ECP: (hhh) $ $30,000.00

3.0 ESTIMATE OF ANNUAL ENERGY COST SAVINGS FOR ABOVE ECP: (iii) $ 21,500.00

4.0 PROJECTED SIMPLE PAYBACK PERIOD FOR ABOVE ECP IN YEARS:

ITEM 2.0 $ 30,000.00 (hhh) ÷ ITEM 3.0 $ 21,500.00 (iii) = 1.4 (jjj) YEARS

THE IMPLEMENTATION OF ENERGY CONSERVATION MAINTENANCE AND OPERATING PROCEDURES ARE A PREREQUISITE CONDITION FOR ELIGIBILITY FOR RECEIVING FEDERAL ASSISTANCE UNDER THE TECHNICAL ASSISTANCE PROGRAM AS DESCRIBED IN 10 CRF PART 455, D.O.E. RULES & REGULATIONS.

FORM EA-4 4-79 REVISED 4-23-79

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SAMPLE WEATHER DATA

Included in this section is a complete copy of solar reference data for the State of Texas and a sample of U. S. Weather Station climatological data. This data is needed for completion of Energy Audit Form EA-2.

Local Climatological Data

Annual Summary With Comparative Data

1977

SAN ANTONIO, TEXAS

SAMPLE DATA
RESOURCE

Narrative Climatological Summary

The City of San Antonio is located in the south-central portion of Texas. Northwest of the City the terrain slopes upward to the Edwards Plateau and to the southeast it slopes downward to the Gulf Coastal Plains. Soils are blackland clay and silty loam on the Plains and thin limestone soils on the Edwards Plateau.

The location of San Antonio on the edge of the Gulf Coastal Plains results in a modified subtropical climate, predominantly continental during the winter months and marine during the summer months. Normal mean temperatures range from 50.7° in January to a high of 84.7° in July. While the summer is hot, with daily maximum temperatures above 90° over 80 percent of the time, extremely high temperatures are rare, the highest on record being 107 degrees. Mild weather prevails during much of the winter months, with below-freezing temperatures occurring on an average of about 20 days each year.

San Antonio is situated between a semiarid area to the west and the coastal area of heavy precipitation to the southeast. The normal annual rainfall of 27.54 inches is sufficient for the normal production of most crops. Precipitation is fairly well distributed throughout the year with heaviest amounts during May in the spring and September in the fall. Precipitation from April through September usually occurs with thunderstorms, with fairly large amounts falling in short periods of time, while most of the winter precipitation occurs as light rain or drizzle. Thunderstorms and heavy rains have occurred in all months of the year. Hail of damaging intensity seldom occurs but light hail is frequent in connection with the springtime thunderstorms. Measurable snow occurs only once in 3 or 4 years with the greatest annual amount 7.4 inches in 1926.

Northerly winds prevail during most of the winter, while southeasterly winds from the Gulf of Mexico prevail during the summertime and may be experienced for long periods during the winter. Rather strong northerly winds occasionally occur during the winter months in connection with "northers." No tornadoes have been experienced in the immediate area.

Being located only 140 miles from the Gulf of Mexico, tropical storms occasionally affect the city with strong winds and heavy rains. The fastest mile of wind recorded, 74 m.p.h., occurred as a tropical storm moved inland east of the city in August 1942.

Relative humidity averages above 80 percent during the early morning hours most of the year, dropping to near 50 percent in the late afternoon.

San Antonio, popularly known as the place "where the sunshine spends the winter," has about 50 percent of the possible amount of sunshine during the winter months and more than 70 percent during the summer months. Skies are clear more than 35 percent of the time and cloudy about 30 percent. Air carried over San Antonio by southeasterly winds is lifted orographically, causing low stratus clouds to develop frequently during the later part of the night. These clouds usually dissipate before noon with clear skies prevailing a high percentage of the time during the afternoon.

Average Temperature

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1930	54.8	61.2	65.2	66.8	78.2	82.6	85.6	84.6	79.6	72.4	58.6	52.8	70.6
1939	54.8	59.2	65.4	70.8	77.8	83.2	85.2	85.4	79.8	73.6	58.0	52.8	70.6
01940	49.8	56.6	64.6	69.6	76.6	79.6	83.4	83.4	78.6	72.6	59.0	54.8	68.7
1941	50.7	52.6	56.8	68.6	76.8	81.8	84.6	84.6	81.6	73.8	59.6	54.6	69.2
01942	54.8	55.6	60.6	68.6	76.8	81.8	85.2	85.6	79.6	69.6	59.8	53.6	69.2
1943	54.8	59.2	58.8	71.8	77.8	81.8	85.6	86.6	78.6	67.6	57.4	50.9	69.2
1944	50.8	57.0	60.6	68.8	76.8	81.8	84.6	84.6	80.2	69.8	59.8	52.6	67.8
1945	51.6	53.6	67.4	67.6	78.6	82.6	84.6	84.6	80.2	69.8	59.8	54.0	68.8
1946	49.2	55.6	63.6	71.8	79.8	83.6	85.2	85.2	80.8	72.6	59.4	53.6	69.4
1947	48.6	60.6	64.0	68.8	78.2	82.6	85.2	85.2	79.2	70.6	57.4	53.6	68.8
1948	49.6	57.0	62.6	70.6	78.6	81.8	85.2	85.2	80.8	70.6	61.6	53.6	69.2
1949	50.8	56.6	65.6	69.6	78.6	81.4	84.6	84.6	81.6	70.6	59.6	55.0	70.2
1950	52.2	57.6	64.6	69.8	78.6	82.6	85.6	86.6	80.6	72.6	59.6	54.0	70.2
1951	54.8	58.2	64.8	68.6	78.6	81.8	85.6	85.6	79.6	71.6	59.4	53.6	69.8
1952	52.6	59.6	64.6	67.7	78.6	84.2	86.6	86.6	79.6	67.6	58.6	54.6	69.6
1953	48.6	54.6	60.6	68.8	77.2	82.6	84.6	84.6	81.6	70.6	59.6	54.0	68.8
1954	50.2	49.6	56.2	69.6	76.6	81.6	84.6	84.6	78.6	70.6	62.6	54.6	67.6
1955	47.6	55.6	63.6	68.8	78.6	81.6	84.6	84.6	79.6	71.6	58.6	54.6	68.9
1956	48.6	49.6	60.6	68.6	75.6	79.6	84.6	81.6	77.6	67.6	63.6	58.7	66.7
1957	56.2	51.6	66.6	76.6	76.6	84.6	85.6	82.6	77.6	69.6	59.6	51.6	69.8
1958	49.6	46.6	56.6	68.6	75.6	80.6	84.6	82.6	78.6	72.6	58.6	56.7	66.8
1959	52.6	53.6	59.6	69.6	77.6	81.6	85.6	85.6	79.6	69.6	59.6	53.6	68.8
1960	48.6	54.6	58.6	70.6	78.6	80.6	84.6	84.6	81.6	67.6	58.6	52.6	68.6
1961	54.6	57.6	64.6	69.6	78.6	81.6	84.6	84.6	80.6	72.6	59.6	57.7	70.9
1962	52.6	56.7	66.6	73.7	78.6	80.6	83.6	83.6	81.6	71.6	59.6	56.6	69.8
1963	47.6	51.6	66.6	74.6	79.6	83.6	85.6	79.6	78.6	71.6	59.6	52.6	68.6
1964	51.6	56.6	67.6	69.7	77.6	79.6	83.6	81.6	78.6	69.6	57.7	50.9	67.9
1965	53.6	59.6	61.6	68.6	78.6	80.6	81.6	79.6	78.6	71.6	59.6	53.6	67.8
1966	49.6	61.6	63.6	68.6	75.6	79.6	79.6	81.6	77.6	61.6	58.6	49.6	66.6
1967	46.6	52.6	61.6	68.6	76.6	81.6	84.6	84.6	80.6	71.6	61.6	53.6	68.8
RECORD MEAN	52.6	55.6	62.2	69.6	78.6	81.6	83.6	84.1	79.2	70.6	60.5	53.7	69.0
MAX	61.6	66.2	72.6	80.6	88.6	91.6	94.2	94.7	89.6	81.7	71.6	64.6	79.2
MIN	43.6	44.2	51.6	58.7	68.6	71.6	73.6	73.6	69.2	59.6	49.9	43.9	58.8

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1937-38	0	0	0	71	278	573	693	619	509	221	0	0	1810
1938-39	0	0	0	99	371	697	813	734	548	94	0	0	1776
1939-40	0	0	0	27	376	826	687	633	593	14	7	0	1040
1940-41	0	0	0	17	130	657	925	778	62	68	0	0	1832
1941-42	0	0	0	19	223	851	1000	886	27	0	0	0	1826
1942-43	0	0	0	9	164	893	975	869	87	17	0	0	1997
1943-44	0	0	0	0	101	592	688	635	560	25	0	0	1761
1944-45	0	0	0	41	139	616	868	619	507	15	0	0	1738
1945-46	0	0	0	68	84	801	887	729	588	58	0	0	1608
1946-47	0	0	0	27	191	836	870	868	60	0	0	0	2060
1947-48	0	0	0	48	164	829	977	678	280	20	0	0	1997
1948-49	0	0	0	0	270	827	906	819	218	3	0	0	1708
1949-50	0	0	0	32	252	899	900	802	459	7	0	0	1680
1950-51	0	0	1	72	247	801	802	739	594	82	1	0	1239
1951-52	0	0	1	8	229	766	882	683	621	7	0	0	1199
1952-53	0	0	0	27	324	827	881	762	89	96	1	0	1857
1953-54	0	0	0	4	93	801	827	857	704	20	0	0	1207
1954-55	0	0	2	19	268	833	880	819	183	61	0	0	1618
1955-56	0	0	1	23	216	904	678	165	158	11	0	0	1428
1956-57	0	0	0	100	362	601	845	830	144	32	0	0	2150
1957-58	0	0	0	19	136	908							

AVG. 1650

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	11	0	0	139	273	494	693	822	660	287	32	2	2969
1970	0	0	28	200	259	478	802	881	693	169	48	27	2967
1971	14	34	138	189	414	566	858	909	619	281	81	31	3366
1972	11	31	109	274	232	462	842	889	215	269	12	4	2660
1973	8	6	99	129	310	431	878	835	674	262	114	0	2846
1974	11	22	171	136	327	430	868	868	557	126	84	0	2804
1975	29	1	91	191	279	427	892	826	585	217	88	30	2688
1976	3	62	113	134	282	451	867	921	892	69	0	0	3300
1977	0	5	92	90	311	882	820	810	818	216	98	3	3990

AVG. 2373

Precipitation

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1930	1.35	0.35	3.05	6.00	3.00	0.65	0.05	0.00	1.05	0.15	0.05	1.25	25.26
1939	2.00	0.05	0.65	0.75	3.25	0.15	2.15	2.00	1.00	4.05	0.05	0.15	16.03
01940	0.00	1.00	0.00	2.50	4.15	7.05	0.00	1.25	1.45	4.00	2.40	2.85	30.79
1941	2.15	1.00	2.05	0.50	2.20	2.05	0.05	0.25	0.05	2.15	0.05	0.05	20.04
01942	0.15	0.00	0.25	3.45	2.75	0.15	1.00	2.00	0.00	0.00	0.00	0.00	10.00
1943	0.75	0.00	1.50	1.45	2.05	0.15	1.25	2.00	0.00	0.15	1.05	0.05	11.31
1944	3.00	1.00	3.75	0.00	5.70	1.00	T	0.25	1.25	1.00	2.00	0.15	29.10
1945	2.05	3.00	2.75	3.05	1.20	0.35	1.15	1.15	3.00	1.05	1.15	0.15	30.00
1946	3.00	2.20	1.75	2.00	2.05	2.00	0.20	4.00	10.75	1.00	1.00	2.00	40.17
1947	2.15	0.25	1.00	0.25	3.25	0.25	1.00	2.50	0.00	0.15	1.05	1.75	17.22
1948	0.05	1.00	0.20	1.00	1.20	2.00	2.05	1.05	2.25	1.00	0.25	0.25	23.00
1949	0.75	1.00	2.25	0.00	0.20	2.20	1.00	0.25	7.25	0.00	0.15	2.75	40.01
1950	0.50	1.05	0.20	2.05	2.00	1.00	0.15	2.00	0.00	0.15	0.00	0.25	19.00
1951	0.25	2.05	2.70	0.05	0.00	7.05	0.05	0.00	3.75	1.00	0.05	0.15	24.00
1952	0.05	2.05	2.20	3.40	1.05	1.00	2.75	0.00	T	0.05	0.05	0.00	26.25
1953	0.05	0.00	0.25	2.00	1.00	2.15	0.05	2.15	2.00	3.00	0.25	1.00	17.25
1954	0.25	0.05	0.05	1.00	1.75	1.25	1.05	0.25	1.25	1.00	0.25	0.25	13.70
1955	1.05	2.25	1.00	0.15	0.00	2.00	1.25	0.05	0.75	0.00	1.25	0.00	19.10
1956	0.05	0.05	0.25	0.05	0.25	0.05	0.00	0.05	1.25	1.15	1.15	1.15	14.01
1957	0.25	2.25	0.15	0.25	2.25	2.05	0.75	0.25	11.15	0.75	2.00	0.05	46.05
1958	4.25	3.25	1.00	1.25	1.00	2.25	7.25	0.45	0.25	0.05	0.75	1.05	39.00
1959	0.25	1.25	0.15	2.25	2.05	1.25	1.00	2.05	1.75	0.15	2.15	1.25	24.00
1960	0.75	1.25	1.05	2.00	1.25	2.75	1.25	2.75	0.75	7.00	1.25	2.05	29.75
1961	0.00	1.75	0.05	0.25	0.15	2.05	7.00	0.15	2.25	2.25	2.00	0.75	25.07
1962	0.00	0.25	0.05	0.00	1.25	2.05	0.25	0.05	1.25	0.15	0.75	2.25	23.00
1963	0.25	2.25	0.25	1.25	2.05	2.25	0.00	2.25	4.15	1.25	1.75	0.75	18.05
1964	2.25	1.05	1.75	1.15	1.75	2.05	0.00	2.15	4.15	1.25	0.05	1.25	21.00
1965	2.00	0.25	2.25	1.05	0.15	2.25	0.00	1.05	2.15	2.00	0.00	0.25	20.00
1966	1.05	2.25	1.15	2.25	2.25	1.75	0.00	4.25	2.15	1.15	T	0.05	21.00
1967	0.15	0.00	2.15	0.05	2.25	0.05	2.15	11.15	2.00	2.05	1.25	0.25	29.25
1968	0.25	1.05	1.25	1.05	2.05	2.05	1.25	0.05	2.05	0.00	0.25	0.05	20.00
1969	1.75	2.00	2.25	0.05	0.25	0.25	0.15	1.25	2.05	1.05	2.25	0.25	21.05
1970	1.15	2.00	1.00	1.15	7.25	0.05	0.05	0.05	4.25	2.25	0.05	0.15	28.74
1971	0.00	0.25	0.00	1.25	1.25	2.75	1.05	0.05	0.05	4.25	4.05	2.75	2.00	31.00
1972	1.25	0.00	0.15	1.75	11.25	2.00	2.15	0.25	1.00	1.25	2.25	0.00	31.00
1973	2.75	2.75	1.25	3.05	2.75	10.05	0.05	1.25	13.00	0.05	0.25	0.15	52.25
1974	1.25	0.00	0.00	2.15	0.25	1.00	1.25	11.15	2.05	0.05	2.25	1.05	37.00
1975	1.00	2.25	0.25	2.05	0.95	0.00	1.00	1.25	0.95	2.25	0.05	1.05	29.07
1976	0.25	0.15	1.25	3.05	5.05	1.05	2.25	2.05	2.75	0.00	2.05	1.05	39.15
1977	2.15	0.05	0.00	0.00	1.05	2.25	0.15	0.00	2.15	2.05	0.05	0.25	29.00
RECORD MEAN	1.00	1.00	1.02	2.05	3.20	2.05	2.02	2.00	3.20	2.05	1.00	1.05	27.71

Snowfall

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1938-39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939-40	0.0	0.0	0.0	0.0	0.0	0.0	3.2	T	0.0	0.0	0.0	0.0	3.2
01940-41	0.0	M.0	0.0	0.0	M.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
1941-42	0.0	M.0	0.0	0.0	M.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942-43	0.0	M.0	0.0	0.0	M.0	0.0	T	0.0	0.0	0.0	0.0	0.0	T
1943-44	0.0	M.0	0.0	0.0	M.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	1.1
1944-45	0.0	M.0	0.0	0.0	M.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945-46	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	T
1946-47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	T
1947-48	0.0	0.0	0.0	0.0	0.0	T	T	0.0	T	0.0	0.0	0.0	T
1948-49	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0	0.0	0.0	0.0	0.0	4.7
1949-50	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	0.0	T
1950-51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
1951-52	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	M.0
1952-53	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	0.0	T
1953-54	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	0.0	T
1954-55	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	T
1955-56	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T
1956-57	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	T
1957-58	0.0	0.0	0.0	0.0	0.0	0.0	1.2	T	0.0	0.0	0.0	0.0	1.2
1958-59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	T
1959-60	0.0	0.0	0.0	0.0	T	0.0	0.0	T	0.0	0.0	0.0	0.0	T
1960-61	0.0	0.0	0.0	0.0	T	T	T	T	0.0	0.0	0.0	0.0	T
1961-62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0
1962-63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	T
1963-64	0.0	0.0	0.0	0.0	0.0	T	T	0.0	T	0.0	0.0	0.0	2.0
1964-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.2
1965-66	0.0	0.0	0.0	0.0	0.0	T	3.0	0.0	0.0	0.0	0.0	0.0	3.0
1966-67	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.0	0.0	T
1967-68	0.0	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.0	T
1968-69	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.0	0.0	0.0
1969-70	0.0	0.0	0.0	0.0	0.0	T	T	T	0.0	0.0	0.0	0.0	T
1970-71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971-72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T
1972-73	0.0	0.0	0.0	0.0	0.0	T	0.0	1.1	0.0	0.0	0.0	0.0	2.0
1973-74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974-75	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.0	0.0	T
1975-76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976-77	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.0	0.0	0.0	T
1977-78	0.0	0.0	0.0	0.0	0.0	0.0							
RECORD MEAN	0.0	0.0	0.0	0.0	T	T	0.3	0.3	T	0.0	0.0	0.0	0.0

0 Indicates a station move or relocation of instruments. See Station Location table.

Record mean values above are means through the current year for the period beginning in 1883 for temperature and precipitation, 1963 for snow. Data are from City Office locations through 1940 and Airport thereafter.

12921 San Antonio, TX

Meteorological Data r The Current Year

Station: SAN ANTONIO, TEXAS INTERNATIONAL AIRPORT Standard time used CENTRAL Latitude: 29° 32' N Longitude: 98° 28' W Elevation (ground): 788 feet Yo ,77

0 12781

Month	Temperatures °F: Averages: Daily maximum	Daily minimum	Monthly	Extremes: Highest	Yr	Lowest	Yr	Degree days Base 65 °F: Heating	Cooling	Precipitation in inches: Water equivalent: Total	Greatest in 24 hrs.	Yr	Snow, ice pellets: Total	Greatest in 24 hrs.	Yr	Relative humidity, pct. (Local time): 00	04	12	16	Wind: Resultant: Direction	Speed m.p.h.	Average speed m.p.h.	Fastest mile: Speed m.p.h.	Direction	Yr	Percent of possible sunshine	Average sky cover, tenths: Sunrise to sunset	Number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, ice pellets .10 inch or more	Thunderstorms	Heavy fog, visibility ¼ mile or less	Temperatures °F: Maximum: 90° and above	32° and below	Minimum: 32° and below	0° and below	Average station pressure: mb	Elev 796 feet msl.
JAN	59.6	36.3	48.1	89	27	20	10	663	0	2.10	1.14	32-23	0.0	0.0		76	80	58	61	02	4.6	10.1	30	01	20	63	6.9	3	11	13	11	0	0	0	0	0	0	11	0	991.3
FEB	66.0	38.8	52.4	83	24	28	27	536	3	0.91	0.42	10-11	0.0	0.0		71	78	58	64	36	1.2	10.6	32	22	24	71	4.8	11	7	10	3	0	0	0	0	0	3	0	990.3
MAR†	76.2	49.4	61.8	89	15	29	7	344	32	0.68	0.37	26-27	0.0	T		71	76	47	49	10	2.0	10.2	28	26	27	68	5.7	6	9	16	3	0	0	0	0	0	3	0	988.1
APR	77.0	56.0	66.9	88	9	41	6	93	98	1.68	4.89	19-20	0.0	0.0		83	89	56	51	12	3.9	10.8	27	29	4	53	5.8	2	9	19	12	0	0	0	0	0	3	0	988.0
MAY	81.6	65.9	74.8	89	31	59	12	0	311	1.68†	1.01	21-22	0.0	0.0		91	93	78	89	16	9.1	10.8	29	04	21	50	6.8	0	3	23	7	0	0	0	0	0	1	0	988.3
JUN	90.2	72.7	81.5	99	7	61	5	0	502	2.26	1.46	22-23	0.0	0.0		82	87	59	56	19	7.6	11.0	29	17	22	57	4.8	0	14	16	0	0	0	1	1	21	0	0	0	986.8
JUL	93.6	76.1	84.9	98	31	71	17	0	620	0.10	0.06	18-19	0.0	0.0		74	83	53	43	13	9.4	10.9	30	10	30	73	4.9	3	19	9	3	0	0	0	0	21	0	0	0	986.2
AUG	93.9	73.3	84.7	97	20	70	4	0	615	0.06	0.03	2	0.0	0.0		73	87	54	47	14	7.0	9.7	23	12	27	83	5.0	3	23	3	3	0	0	0	0	20	0	0	0	985.1
SEP	92.1	72.3	82.2	97	3	63	30	0	525	2.11	1.10	12-13	0.0	0.0		78	88	57	49	16	5.9	10.3	42	10	11	68	4.9	11	13	6	3	0	0	0	0	10	0	0	0	985.1
OCT	81.2	60.1	71.2	94	1	51	13	19	219	3.47	2.10	21-22	0.0	0.0		75	82	55	52	11	2.3	9.1	31	02	11	53	4.6	10	13	8	0	0	0	0	0	0	0	0	0	989.3
NOV	73.3	49.4	61.4	88	15	38	10	136	30	0.81	0.67	1	0.0	0.0		78	84	57	56	28	1.0	9.0	30	08	1	80	3.9	18	4	8	0	0	0	0	0	0	0	0	0	987.2
DEC	66.9	40.0	53.4	89	9	20	12	360	9	0.52	0.28	11-12	0.0	0.0		71	76	52	49	26	2.0	9.2	29	08	9	67	3.6	10	8	13	3	0	0	0	0	0	0	0	0	987.8
YEAR	78.0	57.0	68.0	99	SEP 9	20	DEC 12	1672	2998	29.44	4.89	APR 19-20	0.0	0.0		77	84	58	52	19	5.4	10.1	42	18	SEP 29	67	5.0	91	142	133	77	0	27	30	110	0	27	0	987.9

† DATA CORRECTED AFTER PUBLICATION OF THE MONTHLY ISSUE.

Normals, Means, And Extremes

Month	Temperatures °F: Normal: Daily maximum	Daily minimum	Monthly	Extremes: Record highest	Yr	Record lowest	Yr	Normal Degree days Base 65 °F: Heating	Cooling	Precipitation in inches: Water equivalent: Normal	Maximum monthly	Yr	Maximum in 24 hrs.	Yr	Snow, ice pellets: Maximum monthly	Yr	Maximum in 24 hrs.	Yr	Relative humidity, pct. (Local time): 00	04	12	16	Wind: Mean speed m.p.h.	Prevailing direction	Fastest mile: Speed m.p.h.	Direction	Yr	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, ice pellets .10 inch or more	Thunderstorms	Heavy fog, visibility ¼ mile or less	Temperatures °F: Max. 90° and above	32° and below	Min. 32° and below	0° and below	Average station pressure: mb	Elev 796 feet msl.
(a)				36		36					29		29		29				29	29	29	29	29	19	29			29	29	29	29	29	29	29	29	29	29	29	29	29	29	2
J	61.6	39.8	50.7	89	1971	0	1949	651	0	1.66	6.93	1968	6.84	1971	3.10	1966	4.7	1949	4.7	1949	73	80	69	87	9.1	N	36	NW	1972	49	6.2	9	6	14	0	1	3	0	0	0	0	991.3
F	65.0	43.4	54.2	92	1959	6	1951	518	16	2.06	6.43	1962	6.43	1962	2.24	1962	3.3	1966	3.3	1966	73	78	68	87	10.2	NE	36	NE	1959	38	6.2	7	4	12	0	1	2	0	0	0	0	990.6
M	72.3	49.1	60.8	100	1971	21	1948	394	44	1.34	4.19	1957	4.03	1961	2.36	1943	T	1969	T	1969	72	79	63	87	10.2	SE	37	NE	1959	38	6.3	7	5	13	0	1	1	0	0	0	0	988.1
A	80.2	59.2	69.8	99	1963	33	1975	91	149	2.24	9.32	1957	9.16	1953	0.0	1977	0.0		0.0		77	83	58	78	10.6	SE	37	NE	1959	38	6.4	7	5	9	0	0	0	0	0	0	0	986.6
M	86.2	69.7	78.0	101	1967	44	1954	9	341	3.07	11.24	1972	8.17	1961	0.0	1978	0.0		0.0		81	86	58	83	10.1	SE	33	NW	1966	36	6.3	9	11	17	0	0	0	0	0	0	0	984.6
J	92.4	72.0	82.2	102	1960	59	1964	0	516	2.79	10.44	1973	8.91	1967	0.0	1981	0.0		0.0		88	90	56	91	10.1	SE	39	NE	1959	47	5.9	9	6	6	0	0	0	0	0	0	0	982.8
J	93.6	73.8	84.7	106	1954	63	1967	0	611	1.09	8.19	1962	T	1964	0.97	1982	0.0		0.0		72	87	51	83	9.1	NE	32	NE	1960	39	6.2	7	5	11	0	0	0	0	0	0	0	983.9
A	93.9	73.4	84.7	106	1960	61	1965	0	611	2.41	11.14	1974	8.00	1982	0.07	1980	0.0		0.0		74	86	51	66	8.3	NE	26	NE	1961	36	6.3	7	5	11	0	0	0	0	0	0	0	983.8
S	89.1	69.8	79.2	102	1951	41	1962	0	429	3.71	13.78	1946	8.86	1967	0.0	1973	0.0		0.0		77	86	56	78	7.8	NE	23	NE	1955	33	6.3	7	6	11	0	0	0	0	0	0	0	984.3
O	81.0	59.2	70.3	92	1963	33	1970	92	202	3.04	9.36	1942	T	1952	0.0	1968	0.0		0.0		77	86	56	80	8.3	NE	23	NE	1965	33	6.3	7	5	9	0	0	0	0	0	0	0	986.3
N	71.1	48.8	59.7	91	1963	21	1976	379	69	1.77	6.81	1977	T	1966	0.3	1957	0.3	1957	0.3	1957	76	84	55	84	8.6	NE	28	NE	1960	38	6.4	7	5	9	0	0	0	0	0	0	0	988.2
D	64.6	41.8	53.2	90	1959	14	1950	573	7	1.66	6.91	1963	0.03	1950	0.2	1964	0.2	1964	0.2	1964	78	88	59	87	8.8	N	28	NW	1967	38	6.4	7	5	9	0	0	0	0	0	0	0	990.0
YR	79.6	57.8	68.6	106	AUG 1960	0	JAN 1949	3978	2994	27.24	13.78	SEP 1946	8.86	AUG 1982	7.28	SEP 1973	4.7	JAN 1949	4.7	JAN 1949	76	84	55	91	9.4	SE	39	NE	AUG 1960	91	6.3	109	110	130	51	4	24	23	111	4	23	4	988.1

AVG. WIND

Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows: Highest temperature 107 in August 1969; maximum monthly snowfall 6.4 in January 1926; maximum snowfall in 24 hours 9.0 in January 1940.

(a) Length of record, years, through the current year unless otherwise noted, based on January data.
(b) 70° and above at Alaskan stations.
0 Less than one half.
T Trace.

NORMALS - Based on record for the 1941-1970 period.
DATE OF AN EXTREME - The most recent in cases of multiple occurrence.
PREVAILING WIND DIRECTION - Record through 1963.
WIND DIRECTION - Numerals indicate tens of degrees clockwise from true north. 00 indicates calm.
FASTEST MILE WIND - Speed is fastest observed 1-minute value when the direction is in tens of degrees.

INPUT DATA FOR SOLAR SYSTEMS

November 1978

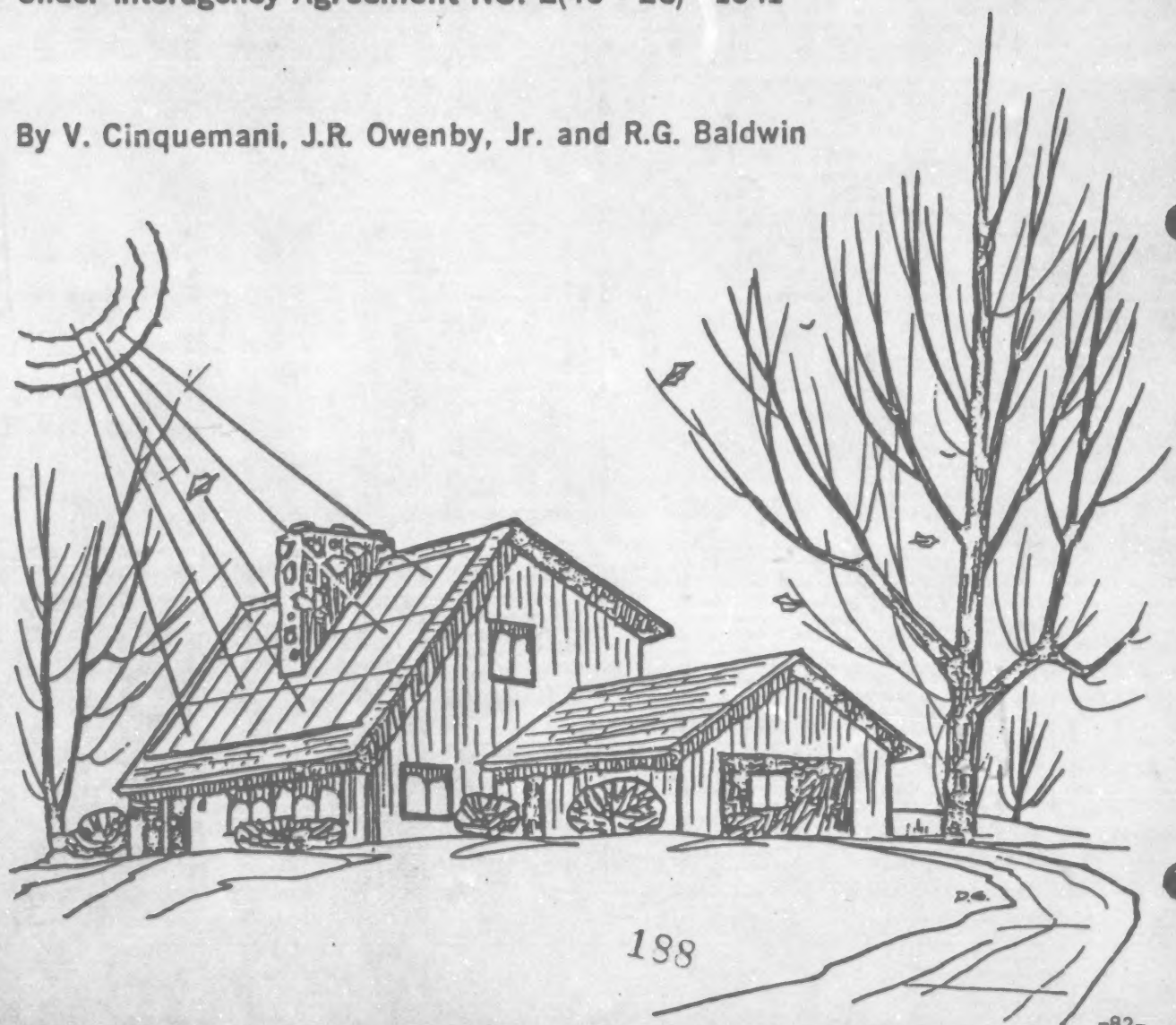
Prepared For

U.S. Department of Energy

Assistant Secretary for Energy Technology
Division of Solar Technology
Environmental Resources And Assessments Branch

Under Interagency Agreement NO. E(49 - 26) - 1041

By V. Cinquemani, J.R. Owenby, Jr. and R.G. Baldwin



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STATION: ABILENE STATE: TX

STATION NUMBER: 13962 LATITUDE: 3226N LONGITUDE: 9941W ELEVATION: 534

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	55.7	31.7	43.7	660	0	923.8	10484.0	250.6
FEB	59.9	35.9	47.9	479	0	1182.6	13421.0	320.8
MAR	67.3	41.7	54.5	354	29	1576.1	17887.0	427.5
APR	77.7	52.7	65.2	104	110	1843.4	20921.0	500.0
MAY	83.9	60.8	72.4	11	240	2037.4	23122.0	552.6
JUN	91.6	69.0	80.3	0	459	2208.7	25066.0	599.1
JUL	95.3	72.4	83.9	0	586	2139.1	24277.0	580.2
AUG	95.3	71.9	83.6	0	577	1956.1	22200.0	530.6
SEP	87.5	64.6	76.1	0	333	1597.6	18131.0	433.3
OCT	78.0	54.2	66.1	89	123	1315.5	14930.0	356.8
NOV	66.2	42.0	54.1	336	9	1007.9	11439.0	273.4
DEC	58.2	34.5	46.4	577	0	863.3	9798.0	234.2
ANN	76.4	52.6	64.5	2610	2466	1554.3	17640.0	421.6

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: AMARILLO STATE: TX

STATION NUMBER: 23047 LATITUDE: 3514N LONGITUDE: 10142W ELEVATION: 1098

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	49.4	22.5	36.0	899	0	960.2	10897.0	260.4
FEB	53.0	26.4	39.7	708	0	1243.5	14112.0	337.3
MAR	60.0	31.2	45.6	601	0	1630.8	18508.0	442.4
APR	70.9	42.1	56.5	275	20	2019.1	22915.0	547.7
MAY	79.2	51.9	65.6	81	99	2211.7	25100.0	599.9
JUN	88.0	61.2	74.6	10	298	2393.1	27159.0	649.1
JUL	91.4	65.9	78.7	0	425	2280.5	25881.0	618.6
AUG	90.4	64.7	77.6	0	391	2103.1	23868.0	570.5
SEP	82.9	56.7	69.8	20	164	1760.5	19980.0	477.5
OCT	72.9	46.1	59.5	206	36	1403.5	15928.0	380.7
NOV	60.0	32.5	46.3	561	0	1032.9	11722.0	280.2
DEC	51.5	25.5	38.5	822	0	871.6	9892.0	236.4
ANN	70.8	43.9	57.4	4183	1433	1659.2	18830.0	450.0

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: AUSTIN STATE: TX

STATION NUMBER: 13958 LATITUDE: 3018N LONGITUDE: 9742W ELEVATION: 189

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	60.0	39.3	49.7	483	8	864.5	9811.0	234.5
FEB	63.8	42.8	53.3	344	16	1124.6	12763.0	305.0
MAR	70.7	48.2	59.5	223	52	1428.9	16217.0	387.6
APR	79.0	58.2	68.6	44	152	1605.1	18216.0	435.4
MAY	85.2	65.1	75.2	0	316	1833.6	20809.0	497.3
JUN	91.7	71.4	81.6	0	498	2072.0	23515.0	562.0
JUL	95.4	73.7	84.6	0	608	2105.5	23895.0	571.1
AUG	95.9	73.5	84.7	0	611	1931.3	21918.0	523.9
SEP	89.4	68.4	78.9	0	417	1606.1	18227.0	435.6
OCT	81.3	58.9	70.1	39	197	1333.3	15131.0	361.6
NOV	70.2	49.0	59.1	205	28	986.7	11198.0	267.6
DEC	63.0	41.6	52.3	399	5	825.1	9364.0	223.8
ANN	78.8	57.4	68.1	1737	2908	1476.4	16755.0	400.5

* BASED ON 1941-1970 PERIOD

AS NOTED IN SOLMET VOLUME 1

STATION: BROWNSVILLE STATE: TX

STATION NUMBER: 12919 LATITUDE: 2554N LONGITUDE: 9726W ELEVATION: 6

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	69.5	51.0	60.3	225	79	912.8	10359.0	247.6
FEB	72.7	54.1	63.4	151	106	1135.4	12886.0	308.0
MAR	76.6	58.8	67.7	89	173	1457.8	16545.0	395.4
APR	83.1	66.7	74.9	0	297	1737.2	19715.0	471.2
MAY	87.1	71.4	79.3	0	443	1927.1	21870.0	522.7
JUN	90.6	75.0	82.8	0	534	2115.3	24006.0	573.8
JUL	92.8	75.9	84.4	0	601	2212.5	25109.0	600.1
AUG	93.0	75.7	84.4	0	601	2027.3	23008.0	549.9
SEP	89.9	73.2	81.6	0	498	1693.9	19224.0	459.5
OCT	84.7	66.6	75.7	5	337	1438.9	16330.0	390.3
NOV	77.5	58.7	68.1	35	128	1054.5	11968.0	286.0
DEC	72.3	53.3	62.8	145	77	862.4	9787.0	233.9
ANN	82.5	65.0	73.8	650	3874	1547.9	17567.0	419.9

* BASED ON 1941-1970 PERIOD

AS NOTED IN SOLMET VOLUME 1

STATION: CORPUS CHRISTI STATE: TX

STATION NUMBER: 12924 LATITUDE: 2746N LONGITUDE: 9730W ELEVATION: 13

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	66.5	46.1	56.3	304	34	898.1	10192.0	243.6
FEB	69.8	49.3	59.6	199	48	1147.4	13022.0	311.2
MAR	75.5	54.2	64.9	120	117	1429.9	16228.0	387.9
APR	82.1	63.4	72.8	0	238	1642.4	18640.0	445.5
MAY	86.6	69.1	77.9	0	400	1866.4	21182.0	506.3
JUN	91.2	73.6	82.4	0	522	2093.8	23762.0	567.9
JUL	94.4	75.2	84.8	0	614	2186.1	24810.0	593.0
AUG	94.8	75.4	85.1	0	623	1990.8	22593.0	540.0
SEP	90.0	72.0	81.0	0	480	1687.0	19146.0	457.6
OCT	84.1	63.7	73.9	7	283	1416.3	16073.0	384.2
NOV	75.2	54.6	64.9	81	78	1042.7	11833.0	282.8
DEC	69.3	48.9	59.1	219	37	844.7	9587.0	229.1
ANN	81.6	62.1	71.9	930	3474	1520.5	17256.0	412.4

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: DALLAS STATE: TX

STATION NUMBER: 13960 LATITUDE: 3251N LONGITUDE: 9651W ELEVATION: 149

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	55.1	35.7	45.4	608	0	821.5	9323.0	222.8
FEB	59.2	39.5	49.4	437	0	1071.1	12156.0	290.5
MAR	66.4	45.2	55.8	314	29	1421.8	16136.0	385.7
APR	76.3	56.4	66.4	71	113	1626.8	18463.0	441.3
MAY	83.1	64.4	73.8	0	273	1888.5	21433.0	512.3
JUN	90.6	72.6	81.6	0	498	2134.9	24229.0	579.1
JUL	95.1	76.3	85.7	0	642	2122.1	24083.0	575.6
AUG	95.7	75.9	85.8	0	645	1950.2	22133.0	529.0
SEP	88.0	68.3	78.2	0	396	1587.1	18012.0	430.5
OCT	78.4	57.5	68.0	55	148	1276.1	14482.0	346.1
NOV	66.4	45.4	55.9	284	11	936.4	10627.0	254.0
DEC	57.8	38.6	48.2	521	0	780.1	8853.0	211.6
ANN	76.0	56.3	66.2	2290	2755	1468.1	16661.0	398.2

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: DEL RIO STATE: TX

STATION NUMBER: 22010 LATITUDE: 2922N LONGITUDE: 10055W ELEVATION: 313

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	63.4	38.1	50.8	449	8	958.3	10876.0	259.9
FEB	68.6	42.8	55.7	283	22	1205.8	13685.0	327.1
MAR	76.4	48.8	62.6	163	88	1580.0	17931.0	428.6
APR	85.1	58.9	72.0	16	226	1699.5	19287.0	461.0
MAY	90.2	66.1	78.2	0	409	1827.1	20736.0	495.6
JUN	96.1	72.4	84.3	0	579	2023.9	22969.0	549.0
JUL	99.2	74.2	86.7	0	673	2054.3	23314.0	557.2
AUG	98.5	73.6	86.1	0	654	1936.5	21977.0	525.3
SEP	91.9	68.5	80.2	0	456	1584.2	17979.0	429.7
OCT	83.1	59.2	71.2	34	226	1359.6	15430.0	368.8
NOV	72.2	46.9	59.6	184	22	1059.5	12024.0	287.4
DEC	65.0	39.5	52.3	394	0	902.6	10244.0	244.8
ANN	82.5	57.4	70.0	1523	3363	1515.9	17204.0	411.2

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: EL PASO STATE: TX

STATION NUMBER: 23044 LATITUDE: 3148N LONGITUDE: 10624W ELEVATION: 1194

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	57.0	30.2	43.6	663	0	1125.1	12769.0	305.2
FEB	62.5	34.3	48.4	465	0	1480.1	16798.0	401.5
MAR	68.9	40.3	54.6	328	6	1909.3	21668.0	517.9
APR	78.5	49.3	63.9	89	56	2363.5	26823.0	641.1
MAY	87.2	57.2	72.2	0	223	2600.6	29514.0	705.4
JUN	94.9	65.7	80.3	0	459	2682.5	30443.0	727.6
JUL	94.6	69.9	82.3	0	536	2450.1	27806.0	664.6
AUG	92.8	68.2	80.5	0	481	2284.5	25927.0	619.7
SEP	87.4	61.0	74.2	0	276	1987.1	22552.0	539.0
OCT	78.5	49.5	64.0	92	61	1639.0	18601.0	444.6
NOV	66.1	37.0	51.6	402	0	1243.7	14115.0	337.4
DEC	57.8	30.9	44.4	639	0	1030.7	11697.0	279.6
ANN	77.2	49.5	63.4	2678	2098	1899.7	21559.0	515.3

BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: FORT WORTH STATE: TX

STATION NUMBER: 3927 LATITUDE: 3250N LONGITUDE: 9703W ELEVATION: 164

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	55.7	33.9	44.8	626	0	805.3	9139.0	218.4
FEB	59.8	37.6	48.7	456	0	1069.4	12136.0	290.1
MAR	66.6	43.3	55.0	335	25	1409.2	15993.0	382.2
APR	76.3	54.1	65.2	88	94	1616.5	18345.0	438.5
MAY	82.8	62.1	72.5	0	236	1890.4	21454.0	512.8
JUN	90.8	70.3	80.6	0	468	2153.0	24434.0	584.0
JUL	95.5	74.0	84.8	0	614	2155.2	24459.0	584.6
AUG	96.1	73.7	84.9	0	617	1982.7	22502.0	537.8
SEP	88.5	66.8	77.7	0	381	1621.3	18400.0	439.8
OCT	79.2	56.0	67.6	60	141	1292.9	14673.0	350.7
NOV	67.5	44.1	55.8	287	11	938.0	10645.0	254.4
DEC	58.7	37.0	47.9	530	0	765.7	8690.0	207.7
ANN	76.5	54.4	65.5	2382	2587	1474.9	16739.0	400.1

* BASED ON 1941-1970 PERIOD

AS NOTED IN SOLMET VOLUME 1

STATION: HOUSTON STATE: TX

STATION NUMBER: 12960 LATITUDE: 2959N LONGITUDE: 9522W ELEVATION: 33

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	62.6	41.5	52.1	416	16	772.4	8766.0	209.5
FEB	66.0	44.6	55.3	294	22	1034.2	11737.0	280.5
MAR	71.8	49.8	60.8	189	59	1297.4	14724.0	351.9
APR	79.4	59.3	69.4	23	155	1522.3	17277.0	412.9
MAY	85.9	65.6	75.8	0	335	1774.9	20143.0	481.4
JUN	91.3	70.9	81.1	0	483	1898.1	21541.0	514.8
JUL	93.8	72.8	83.3	0	567	1828.1	20747.0	495.9
AUG	94.3	72.4	83.4	0	570	1686.2	19137.0	457.4
SEP	90.1	68.2	79.2	0	426	1471.0	16694.0	399.0
OCT	83.5	58.3	70.9	24	207	1275.6	14477.0	346.0
NOV	73.0	49.1	61.1	155	38	924.0	10486.0	250.6
DEC	65.8	43.4	54.6	333	11	729.6	8280.0	197.9
ANN	79.8	58.0	68.9	1434	2889	1351.1	15334.0	366.5

* BASED ON 1941-1970 PERIOD

AS NOTED IN SOLMET VOLUME 1

STATION: KINGSVILLE STATE: TX

STATION NUMBER: 12928 LATITUDE: 2731N LONGITUDE: 9749W ELEVATION: 17

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	NORMAL DEGREE DAYS* BASE 65 DEG F MONTHLY	HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	0.0	0.0	0.0	0	0	912.3	10354.0	247.5
FEB	0.0	0.0	0.0	0	0	1161.2	13178.0	315.0
MAR	0.0	0.0	0.0	0	0	1434.7	16282.0	389.1
APR	0.0	0.0	0.0	0	0	1662.8	18871.0	451.0
MAY	0.0	0.0	0.0	0	0	1864.1	21156.0	505.6
JUN	0.0	0.0	0.0	0	0	2035.9	23105.0	552.2
JUL	0.0	0.0	0.0	0	0	2111.5	23963.0	572.7
AUG	0.0	0.0	0.0	0	0	1921.5	21807.0	521.2
SEP	0.0	0.0	0.0	0	0	1624.6	18438.0	440.7
OCT	0.0	0.0	0.0	0	0	1389.9	15774.0	377.0
NOV	0.0	0.0	0.0	0	0	1034.3	11738.0	280.5
DEC	0.0	0.0	0.0	0	0	849.3	9639.0	230.4
ANN	0.0	0.0	0.0	0	0	1500.1	17025.0	406.9

BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: LAREDO STATE: TX

TATION NUMBER: 12907 LATITUDE: 2732N LONGITUDE: 9928W ELEVATION: 158

ONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	NORMAL DEGREE DAYS* BASE 65 DEG F MONTHLY	HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	0.0	0.0	56.5	299	36	958.9	10882.0	260.1
FEB	0.0	0.0	60.9	177	62	1195.5	13568.0	324.3
MAR	0.0	0.0	67.6	87	168	1515.6	17201.0	411.1
APR	0.0	0.0	76.3	0	339	1726.9	19599.0	468.4
MAY	0.0	0.0	81.3	0	505	1951.9	22152.0	529.4
JUN	0.0	0.0	86.0	0	630	2073.1	23527.0	562.3
JUL	0.0	0.0	87.9	0	710	2131.2	24187.0	578.1
AUG	0.0	0.0	87.7	0	704	2009.1	22801.0	545.0
SEP	0.0	0.0	82.9	0	537	1705.3	19353.0	462.5
OCT	0.0	0.0	75.5	8	334	1408.2	15982.0	382.0
NOV	0.0	0.0	65.2	74	80	1040.8	11812.0	282.3
DEC	0.0	0.0	58.6	231	32	889.5	10095.0	241.3
ANN	0.0	0.0	73.9	876	4137	1550.5	17597.0	420.6

BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: LUBBOCK STATE: TX

STATION NUMBER: 23042 LATITUDE: 3339N LONGITUDE: 10149W ELEVATION: 988

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	53.4	24.8	39.1	803	0	1030.9	11700.0	279.6
FEB	57.0	28.3	42.7	624	0	1331.7	15113.0	361.2
MAR	63.8	34.0	48.9	508	9	1762.0	19997.0	477.9
APR	74.8	45.1	60.0	190	40	2167.8	24602.0	588.0
MAY	82.5	54.5	68.5	29	138	2395.9	27191.0	649.9
JUN	90.6	63.6	77.1	0	363	2544.4	28876.0	690.2
JUL	92.4	66.9	79.7	0	456	2411.8	27371.0	654.2
AUG	91.3	65.5	78.4	0	415	2208.4	25063.0	599.0
SEP	83.8	58.2	71.0	8	188	1820.1	20656.0	493.7
OCT	74.7	47.3	61.0	162	38	1468.2	16662.0	398.2
NOV	63.1	34.4	48.8	486	0	1116.1	12666.0	302.7
DEC	55.2	27.4	41.3	735	0	934.5	10606.0	253.5
ANN	73.6	45.8	59.7	3545	1647	1766.0	20042.0	479.0

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: LUFKIN STATE: TX

STATION NUMBER: 93987 LATITUDE: 3114N LONGITUDE: 9445W ELEVATION: 96

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	0.0	0.0	48.8	509	7	793.9	9010.0	215.3
FEB	0.0	0.0	52.2	371	13	1069.2	12134.0	290.0
MAR	0.0	0.0	58.0	256	39	1376.1	15617.0	373.3
APR	0.0	0.0	67.3	56	125	1623.9	18429.0	440.5
MAY	0.0	0.0	74.1	0	282	1866.7	21185.0	506.3
JUN	0.0	0.0	80.3	0	459	2055.3	23326.0	557.5
JUL	0.0	0.0	83.0	0	558	2006.4	22770.0	544.2
AUG	0.0	0.0	83.1	0	561	1864.1	21155.0	505.6
SEP	0.0	0.0	77.5	0	375	1530.7	17372.0	415.2
OCT	0.0	0.0	68.2	52	151	1348.7	15306.0	365.8
NOV	0.0	0.0	57.2	256	22	963.3	10932.0	261.3
DEC	0.0	0.0	50.8	440	0	767.6	8712.0	208.2
ANN	0.0	0.0	66.7	1940	2592	1438.8	16329.0	390.3

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: MIDLAND-ODESSA STATE: TX

STATION NUMBER: 23023 LATITUDE: 3156N LONGITUDE: 10212W ELEVATION: 871

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	57.8	29.4	43.6	663	0	1081.2	12271.0	293.3
FEB	62.1	33.5	47.8	482	0	1382.6	15691.0	375.0
MAR	69.4	39.2	54.3	349	17	1838.8	20868.0	498.8
APR	79.1	49.4	64.3	98	77	2192.3	24880.0	594.6
MAY	86.5	58.1	72.3	0	230	2430.1	27579.0	659.2
JUN	92.8	66.9	79.9	0	447	2562.4	29081.0	695.1
JUL	95.0	69.5	82.3	0	536	2389.3	27116.0	648.1
AUG	94.4	69.1	81.8	0	521	2210.1	25082.0	599.5
SEP	87.9	62.8	75.4	0	312	1843.9	20926.0	500.1
OCT	79.2	52.4	65.8	81	105	1521.6	17269.0	412.7
NOV	67.5	39.1	53.3	356	5	1176.1	13348.0	319.0
DEC	60.1	31.6	45.9	592	0	999.7	11346.0	271.2
ANN	77.7	50.1	63.9	2621	2250	1802.4	20455.0	488.9

BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: PORT ARTHUR STATE: TX

STATION NUMBER: 12917 LATITUDE: 2957N LONGITUDE: 9401W ELEVATION: 7

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	61.5	42.4	52.0	420	17	799.7	9076.0	216.9
FEB	65.0	45.1	55.1	302	25	1070.6	12150.0	290.4
MAR	70.5	49.7	60.1	202	51	1353.1	15356.0	367.0
APR	78.3	59.4	68.9	33	150	1609.5	18266.0	436.6
MAY	84.3	65.7	75.0	0	310	1870.8	21232.0	507.5
JUN	89.9	71.7	80.8	0	474	2011.1	22824.0	545.5
JUL	92.0	74.0	83.0	0	558	1846.2	20952.0	500.8
AUG	92.6	73.6	83.1	0	561	1736.3	19705.0	471.0
SEP	88.6	69.2	78.9	0	417	1527.0	17330.0	414.2
OCT	81.3	58.5	69.9	35	187	1321.4	14997.0	358.4
NOV	70.9	49.4	60.2	184	40	952.9	10814.0	258.5
DEC	64.2	44.1	54.2	342	8	754.4	8562.0	204.6
ANN	78.3	58.6	68.5	1518	2798	1404.4	15939.0	381.0

BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: SAN ANGELO STATE: TX

STATION NUMBER: 23034 LATITUDE: 3122N LONGITUDE: 10030W ELEVATION: 582

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	59.1	33.6	46.4	577	0	961.8	10915.0	260.9
FEB	63.2	37.5	50.4	413	0	1208.4	13714.0	327.8
MAR	70.7	43.5	57.1	287	42	1606.1	18227.0	435.6
APR	80.4	54.0	67.2	74	140	1850.7	21004.0	502.0
MAY	86.5	62.4	74.5	0	298	2030.6	23045.0	550.8
JUN	93.4	69.8	81.6	0	498	2186.1	24810.0	593.0
JUL	96.9	72.4	84.7	0	611	2122.6	24089.0	575.7
AUG	96.9	72.0	84.5	0	605	1965.8	22310.0	533.2
SEP	88.4	65.1	76.8	0	354	1607.2	18240.0	435.9
OCT	79.6	54.7	67.2	73	141	1336.7	15170.0	362.6
NOV	68.5	42.5	55.5	298	13	1043.8	11846.0	283.1
DEC	61.4	35.2	48.3	518	0	894.7	10154.0	242.7
ANN	78.7	53.6	66.2	2240	2702	1567.9	17794.0	425.3

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: SAN ANTONIO STATE: TX

STATION NUMBER: 12921 LATITUDE: 2932N LONGITUDE: 9828W ELEVATION: 242

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	61.6	39.8	50.7	451	8	895.4	10162.0	242.9
FEB	65.6	43.4	54.5	310	16	1154.0	13097.0	313.0
MAR	72.5	49.1	60.8	194	64	1450.0	16456.0	393.3
APR	80.3	58.8	69.6	31	169	1612.3	18298.0	437.3
MAY	86.2	65.7	76.0	0	341	1894.5	21501.0	513.9
JUN	92.4	72.0	82.2	0	516	2069.0	23481.0	561.2
JUL	95.6	73.8	84.7	0	611	2121.1	24072.0	575.3
AUG	95.9	73.4	84.7	0	611	1947.1	22098.0	528.2
SEP	89.8	68.8	79.3	0	429	1638.0	18589.0	444.3
OCT	81.8	59.2	70.5	32	202	1350.1	15322.0	366.2
NOV	71.1	48.2	59.7	179	20	1008.9	11450.0	273.7
DEC	64.6	41.8	53.2	373	7	847.1	9614.0	229.8
ANN	79.8	57.8	68.8	1570	2994	1499.0	17012.0	406.6

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: SHERMAN STATE: TX

STATION NUMBER: 13923 LATITUDE: 3343N LONGITUDE: 9640W ELEVATION: 233

	NORMAL TEMPERATURE (DEG F)*		NORMAL DEGREE DAYS*			TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION#		
				BASE 65 DEG F				
MONTH	DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	HEATING	COOLING	BTU/FT2	KJ/M2	LANGLEYS
JAN	0.0	0.0	41.7	722	0	793.8	9009.0	215.3
FEB	0.0	0.0	45.9	535	0	1037.4	11773.0	281.4
MAR	0.0	0.0	52.3	411	17	1365.9	15501.0	370.5
APR	0.0	0.0	63.7	114	75	1610.4	18276.0	436.8
MAY	0.0	0.0	71.2	13	206	1851.9	21017.0	502.3
JUN	0.0	0.0	79.4	0	432	2114.2	23994.0	573.5
JUL	0.0	0.0	83.6	0	577	2076.8	23569.0	563.3
AUG	0.0	0.0	83.7	0	580	1931.6	21922.0	523.9
SEP	0.0	0.0	76.0	0	335	1580.1	17932.0	428.6
OCT	0.0	0.0	65.8	90	115	1268.1	14392.0	344.0
NOV	0.0	0.0	53.4	353	0	918.9	10428.0	249.2
DEC	0.0	0.0	44.8	626	0	743.8	8441.0	201.7
ANN	0.0	0.0	63.5	2864	2337	1441.1	16355.0	390.9

BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: WACO STATE: TX

STATION NUMBER: 13959 LATITUDE: 3137N LONGITUDE: 9713W ELEVATION: 155

	NORMAL TEMPERATURE (DEG F)*		NORMAL DEGREE DAYS*			TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION#		
				BASE 65 DEG F				
MONTH	DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	HEATING	COOLING	BTU/FT2	KJ/M2	LANGLEYS
JAN	57.4	36.6	47.0	558	0	832.6	9449.0	225.8
FEB	61.5	40.3	50.9	401	6	1096.3	12442.0	297.4
MAR	68.4	46.0	57.2	280	38	1427.5	16201.0	387.2
APR	77.8	56.8	67.3	56	125	1612.1	18296.0	437.3
MAY	84.4	64.5	74.5	0	295	1773.6	20128.0	481.1
JUN	91.9	71.8	81.9	0	507	2112.4	23974.0	573.0
JUL	96.2	75.0	85.6	0	639	2130.3	24177.0	577.8
AUG	96.7	74.7	85.7	0	642	1958.1	22222.0	531.1
SEP	89.5	68.3	78.9	0	417	1600.9	18169.0	434.2
OCT	80.4	57.7	69.1	51	178	1301.3	14768.0	353.0
NOV	68.7	46.2	57.5	241	16	956.7	10858.0	259.5
DEC	60.5	39.1	49.8	471	0	802.8	9111.0	217.8
ANN	77.8	56.4	67.1	2058	2863	1467.1	16650.0	397.9

BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

STATION: WICHITA FALLS STATE: TX

STATION NUMBER: 13966 LATITUDE: 3358N LONGITUDE: 9829W ELEVATION: 314

MONTH	NORMAL TEMPERATURE (DEG F)* DAILY MAXIMUM	DAILY MINIMUM	MONTHLY	NORMAL DEGREE DAYS* BASE 65 DEG F HEATING	COOLING	TOTAL HEMISPHERIC MEAN DAILY SOLAR RADIATION# BTU/FT2	KJ/M2	LANGLEYS
JAN	53.5	29.4	41.5	729	0	862.0	9783.0	233.8
FEB	58.1	33.6	45.9	535	0	1122.9	12744.0	304.6
MAR	65.8	39.2	52.5	409	22	1471.9	16704.0	399.2
APR	77.4	51.1	64.3	112	91	1762.8	20006.0	478.2
MAY	84.7	59.8	72.3	13	239	2017.3	22894.0	547.2
JUN	93.9	68.6	81.3	0	489	2221.4	25210.0	602.5
JUL	99.2	72.3	85.8	0	645	2166.5	24587.0	587.6
AUG	99.4	71.6	85.5	0	636	1969.2	22348.0	534.1
SEP	90.3	63.6	77.0	0	360	1601.8	18179.0	434.5
OCT	79.2	52.7	66.0	92	123	1291.4	14656.0	350.3
NOV	66.0	39.7	52.9	369	6	957.3	10864.0	259.7
DEC	56.2	32.2	44.2	645	0	798.8	9066.0	216.7
ANN	77.0	51.2	64.1	2904	2611	1520.2	17253.0	412.4

* BASED ON 1941-1970 PERIOD # AS NOTED IN SOLMET VOLUME 1

MAINTENANCE AND OPERATIONS

This section contains M&O examples which should be reviewed prior to completing Page EA-3 of the Energy Audit Form.

SECTION ONE

Maintenance and Operations

I. VENTILATION SYSTEM OPERATION

A. Reduced Ventilation

1. Shut off exhaust fan hoods in laboratories, kitchens, bakeries, and cafeterias when operations are completed. Add control damper or gravity damper to keep the air path in the exhaust duct closed when fan is not operating if it will not interfere with safety.

2. Reduce ventilation rates during occupied periods to a minimum possible, usually about 5 CFM per person. See ASHRAE Standard 62-73 for reasonable values. Use the minimums listed in the Standards.

3. Concentrate smoking areas together so that one ventilation system can serve them all. Adjust outdoor air to serve those areas and reduce all other outdoor air to systems.

4. Some hoods exhaust much more air than necessary. Reduce the quantity of exhaust air from hoods in laboratories, kitchens, and similar operations by closing off a portion of the hood, changing hood type from canopy to high velocity, or slowing down exhaust fans to the point just necessary to satisfy exhaust requirements. Verify safety requirements for each specific case. In most cases it is necessary to maintain a minimum of 100 fpm across face of hood.

B. Variable Ventilation

1. Operate kitchen exhaust systems intermittently throughout the day. Turn them off when they are not needed. Operate them at noon, during coffee breaks, and at heavy cooking times.

2. Shut off laboratory hoods in air conditioned areas when not needed.

C. Unoccupied Area Ventilation Shut Down

1. If air handling units that supply heated or cooled air are equipped with outdoor air inlet ducts and dampers, close dampers during unoccupied periods.

2. Outdoor air quantities for window units, through-the-wall units, and fan coil units generally are fixed. When these units are used to maintain nighttime or unoccupied cycle room temperatures, the outdoor air

intakes are generally open. If dampers are available, close them when outdoor air is not needed. Where infiltration is sufficient for daytime ventilation requirements, block off the outdoor air damper completely for some or all of the units.

D. Repair of Caulking & Weather Stripping - Class I

1. Examine the entire building for air leaks. Around windows, doors and any other place where leaks might occur. Seal up the leaks.

E. Maintenance and Repair of Operating Controls - Class I

1. Check to see that all automatic dampers on exhaust fans and outside air intakes close when their respective air handling unit is turned off or when they are supposed to turn off if the control function is different than noted.

2. Check all motorized dampers on air handling units for proper operation and tight closing.

II. HEATING AND COOLING SYSTEM OPERATION

A. Change in Thermostat Control Set Points - Class I

1. Cool office, general purpose, academic, and residential buildings to 74°F or higher as practical. Special consideration should be given to computer rooms and research areas.

2. Lower the thermostats during the heating season and raise thermostats during the cooling season in areas served by single zone systems. If your building is like most, you can save about 8% of your heating fuel bill by lowering the thermostat(s) a mere five degrees.

3. Use night setback on single zone heating systems with suitable controls. Maintaining 55°F or 60°F at night will reduce energy consumption by 15% to 20% during the night hours. See II.D for shutdown information which will save more energy.

4. Calibrate all thermostats and set them for temperatures in keeping with energy conservation goals.

B. Provide Locking Thermostat Covers - Class I

1. Use locking thermostat covers in all public areas.

2. Use locking thermostat covers in all private offices and research laboratories where temperatures are being arbitrarily controlled or where the room thermostat is used to reset hot and cold deck temperatures.

C. Reset of Air and Water Temperatures - Class I

1. Terminal Reheat System

(a) De-energize or shut off reheat coils and raise chilled water supply air temperature in summer months in increments of 2°F to determine the highest supply temperature that will maintain satisfactory room conditions.

(b) Reduce supply air quantity if space cooling loads will permit.

(c) Set temperature of air entering reheat coil as high as practical to reduce reheat requirements.

2. Dual Duct System

(a) Refer to "Terminal Reheat System" for general recommendations applicable to dual duct system.

(b) Reduce inlet static to all boxes to minimally acceptable level by slowing down the fan. It is not expected that this will work very often in buildings which have been properly balanced.

(c) During the hot part of the summer time, valve off the hot water supply and allow the hot deck to simply be return air.

3. Multizone System

(a) Set controls to reduce hot deck temperatures and increase cold deck temperatures, consistent with the loads of critical zones. While this will lower energy consumption, it also will reduce the heating and cooling capabilities of the system as compared to current levels.

(b) In the very warm portion of the summer time valve the hot water supply closed and allow the hot deck to simply be return air.

4. Single Zone System

(a) Implementing energy conservation measures in the building that reduce the heating and/or cooling loads served by the HVAC system will result in reduced fan power input requirements. Fan brake horsepower varies directly with the cube of air volume. Thus, for example, a 10% reduction in air volume will permit a reduction in fan power input of about 27%. This modification will limit the degree to which the zone serviced can be heated or cooled as compared to current capabilities.

5. Fan Coil System

(a) Refer to "Single Zone System" for general recommendation applicable to fan coil system.

(b) Block off outdoor air inlets where no dampers are installed if infiltration meets ventilation requirements. Humidity control during summer months may not allow this measure.

6. Constant Volume System

(a) Determine the minimum amount of air flow that is satisfactory and reset the constant volume device accordingly.

7. Variable Air Volume System

(a) Reduce the volume of air handled by the system to a point that is satisfactory.

(b) Lower hot water temperature and raise chilled water temperature in accordance with space requirements. Consider whether fan horsepower reduction with reduced volume produces more savings than higher chilled water temperature.

8. Use an outside temperature sensing unit to modulate hot water heating systems by increasing water temperature as outside air drops and decreasing water temperature as outside air rises. When fan coil units are used to provide both heating and cooling, the hot water should be modulated down to a maximum temperature of 75°F when the ambient temperature is 60°F.

D. Unoccupied Reset or Shut Down of System - Class I

1. Shut down cooling equipment at night and during days when the building is unoccupied.

2. Begin precooling operations before occupants arrive. Complete cool-down during the first hour of occupancy if complaint level will allow.

3. Heat general purpose and academic buildings to 70°F when occupied. This does not mean that air should be cooled if the temperature exceeds 70°F. This is applicable only to single zone and other single systems.

4. Evaluate the necessity of humidification systems and curtail humidification in lobbies, corridors, laundries, cafeterias, kitchens, etc., where equipment or process requirements do not take precedence.

5. Turn off portable electric heaters and portable fans when not needed and during unoccupied periods.

6. Turn off reheat in all areas during summer, except where equipment requirements necessitate humidity control.

7. Self-Contained Systems (Such as Window & Thru-the-Wall Units)

(a) Turn off cooling units and fan when leaving space.

(b) Use timers to shut units off automatically if available.

E. Shut Down Non-Critical Exhaust Systems - Class I

1. Turn off non-critical exhaust fans.

III. LIGHTING SYSTEMS OPERATIONS

A. Reduce Illumination Levels - Class I

1. To the extent permitted by productivity requirements and related concerns, group tasks which require approximately the same levels of illumination. This may reduce the number of areas requiring higher illumination levels and provide an opportunity to reduce the total amount of lighting needed.

2. Reduce lighting levels in corridors and storage rooms.

B. Maximize Use of Daylight - Class I

1. Leave the hallway lighting off on those hallways facing the interior courtyards during daylight hours, assuming a light meter reading indicates the lighting level is satisfactory.

2. Take advantage of natural daylight in your survey of lighting requirements, and instruct personnel to do likewise as a habit.

C. Install High Efficiency Lamps - Class I

1. Consider replacing present lamps with those of lower wattage which provide the same amount of illumination or, if acceptable in light of tasks involved, a lower level of illumination. Lens changes or lowering the luminaire often can help facilitate this option. This method is particularly applicable where current lighting levels are higher than recommended or where uniform lighting is the most practical due to occupant density, as discussed above. Be certain that new lamps are compatible for use with existing ballast in fluorescent and high-intensity discharge (HID) fixtures. Investigate color spectrum of lamp to determine suitability for task.

2. Use a single, larger incandescent lamp where possible, rather than two or more smaller lamps. Higher wattage general service incandescent lamps are more efficient than lower wattage lamps, unless such use is detrimental to fixture efficiency.

3. When relamping, replace 40 watt fluorescent lamps with 35 watt lamps to achieve a reduction in lighting level of approximately 18%, while saving 20% in fixture electrical energy. Investigate color spectrum of lamp to determine suitability for task.

D. Reduce or Delete Evening Cleaning Hours - Class I

1. For cleaning that must be done at night, turn on lights only in that portion of the building being cleaned.

2. Re-align working hours, including custodial service, to maximize daylight hours.

3. Have custodial staff clean buildings one floor at a time and use only lights on that floor during cleaning process. Make sure staff turns them off as work progresses to another floor.

IV. WATER SYSTEM OPERATIONS

A. Repair All Leaks - Class I

1. Repair all leaks in water piping system.

2. Dripping taps or valves may seem to be a little thing, yet they result in significant waste. One drop a second can add up to about 200 gallons a month down the drain.

3. Repack pump packing glands of recirculation hot water heaters to reduce leaking of hot water.

B. Reduction of Water Consumption (Flow Restriction) - Class I

1. Insert orifices in hot water pipes to reduce flow.

2. Check toilet flushometers and tank type water flush levels to reduce flushing time and water quantities to the minimum required. Repair or replace as necessary.

3. Turn off water using laboratory equipment when not in use.

4. Laboratory aspirators use two gallons of water per minute. The cost of providing water to the aspirator and of disposing of the effluent is in the order of 60 cents per day per aspirator. Turn them off when not needed.

5. Adjust valves for minimum water use.

C. Reduce Hot Water Temperature - Class I

1. Reduce generating and storage temperature levels to the minimum required for washing hands, usually about 105°F. Boost hot water temperature locally for kitchens and other areas where it is needed, rather than provide higher than necessary temperatures for the entire building.

2. Domestic hot water should be cut off to all academic and administrative buildings except where necessary for research or health purposes.

Domestic hot water to other buildings should be reduced in temperature or cut off as feasible. Suggested temperatures range from 105°F up to 130°F, 140°F maximum for special purposes.

D. Increase Chilled Water Temperature - Class I

1. Increase chilled water temperatures as high as possible in process applications. See Heating and Cooling System Operation for other items.

V. UTILITY PLANT AND DISTRIBUTION SYSTEM OPERATION

A. Equipment Cleaning - Class I

1. Hot and Chilled Water Piping:

(a) Inspect strainers. Clean regularly.

(b) Inspect vents and remove all clogs. Clogged vents retard efficient air elimination and reduce efficiency of the system.

B. Adjustment of Air/Fuel Ratio - Class I

1. Adjust air/fuel ratios of firing equipment. The air-to-fuel ratio must be maintained properly. If there is insufficient air, the fire will smoke, cause tubes to become covered with soot and carbon, and thus lower heat transfer efficiency. If too much air is used, unused air is heated by combustion and exhausted up the stack, wasting energy.

C. Combustion Monitoring and Control - Class I

1. Check flue gas analysis on periodic basis. The efficient combustion of fuel in a boiler requires burner adjustment to achieve proper stack temperature, carbon dioxide, and excess air settings. Check settings to provide stack temperatures of no more than 150°F above steam or water temperature, but sufficient to prevent sulphur dioxide corrosion of equipment. There should be no carbon monoxide. For a gas-fired unit, carbon dioxide should be present at 9% or 10%; for No. 2 oil, 11.5% to 12.8%; for No. 6 oil, 13% to 13.8%.

D. Adjustment of Drives, Fans, Motors, Etc. - Class I

1. Lubricate all bearings and other moving parts.

2. Lubricate drive motors.

3. Where belts are used, see that all are equally tensioned.

4. When belts are frayed or need replacing, replace with matched set if there are multiple belts.

5. Check fans for proper air quantity as recommended by manufacturer.

6. Check alignment of motor and fan.

7. Lubricate fan and motor bearings regularly.

8. Check for excessive noise and vibration on fans. Determine cause and correct.

9. Keep fan blades clean.

10. Inspect inlet and discharge screens on fans. They should be kept free of dirt and debris at all times.

E. Steam Trap Maintenance - Class I

1. Inspect steam traps. Their failure to operate correctly can have a significant impact on the overall efficiency and energy consumption of the system. Several different tests can be utilized to determine operations:

(a) Listen to the trap to determine if it is opening and closing when it should.

(b) Feel the pipe on the downstream side of the trap. If it is excessively hot, the trap probably is passing steam. This can be caused by dirt in the trap, valve off stem, excessive steam pressure, or worn trap parts (especially valve and seats). If it is moderately hot - as hot as a hot water pipe, for example - it probably is passing condensate, which it should do. If it is cold, the trap is not working at all.

(c) Check back-pressure on downstream side.

(d) Measure temperature of return lines with a surface pyrometer. Measure temperature drop across the trap. Lack of drop indicates steam blow-through. Excessive drop indicates that the trap is not passing condensate. Adjust, repair, or replace all faulty traps.

2. Inspect condensate tank vents. Plumes of steam are an indication of one or more defective traps. Determine which traps are defective and adjust, repair, or replace as necessary.

F. Pipe Insulation Repair - Class I

1. Inspect insulation of hot and chilled water pipes. Repair or replace as necessary. Be certain to replace any insulation damaged by water. Determine source of water leakage and correct.

2. Insulation of heating pipes in utility tunnels should be checked, repaired or additional insulation installed.

ENERGY CONSERVATION MEASURES/PROJECTS

This section contains a list of possible retrofit projects. This section should be reviewed prior to completing Page EA-4 of the Energy Audit Form.

SECTION TWO

Energy Conservation Projects

I. VENTILATION SYSTEM

A. Add warm-up cycle to air handling units with outdoor air intake in noncritical areas. Keep outdoor air dampers closed during morning building warm-up or cool-down so only air already in the building is conditioned. A cycle can be incorporated using a two-circuit time clock to control air damper and fan operation or it may be done through central control system.

B. Reduce volume of toilet exhausts in building having multiple toilet exhaust fans which (1) do not ventilate other areas, and (2) have a total fan capacity in excess of outside air requirements. This can be done by wiring a fan interlock into toilet room lights through a timed relay so that the fan is activated only when lights are on. An administrative request plus signs indicating that lights should be turned off when the room is not in use will help ensure that lights (and thus the fans) are off when the room is not being used. Another method involves dampering down air volume so only that amount of air required by code or good practice is removed.

C. Install baffles to prevent wind from blowing directly into an outdoor air intake.

D. Consider installing economizer/enthalpy controls on air handling units in noncritical areas to minimize cooling energy required by using proper amounts of outdoor and return air to permit "free cooling" by outside air when possible. Economizer controls generally are used to provide "free" cooling. Whenever the outdoor air temperature is lower than indoor temperature, outdoor air is brought directly into conditioned spaces, instead of being treated by the mechanical cooling system. Enthalpy controls have a similar purpose, but are more sophisticated and effective. They measure the total heat content of outdoor air and return air and utilize proper amounts of each to provide maximum energy benefits.

E. When more than 10,000 CFM are involved, and when building configuration permits, consider installation of heat recovery devices such as a rotary heat exchanger. For some climatic conditions an "enthalpy wheel", which permits recovery of some 75% of outdoor heat load during both heating and cooling cycles, will be feasible.

F. Consider directing exhaust air to loading dock areas to maintain positive pressure. Consider making delivery entrances smaller. The larger the opening, the more air infiltration when doors are open.

G. Consider using an expandable enclosure for delivery ports. It reduces infiltration when in use because it can be adjusted to meet the back of a truck, reducing substantially the amount of air which otherwise would infiltrate.

H. Consider installation of a vestibule for the front entrance of a building where practical. It should be fitted with self-closing weather-stripped doors. It is critical that sufficient distance between doors is provided.

I. Consider utilizing revolving doors for main access, in addition to swinging doors needed by those in wheelchairs or on crutches. Studies have shown that such devices allow far less air to infiltrate with each entrance or exit. Use of revolving doors in both elements of a vestibule is even more effective. If high peak traffic is involved, swinging doors can be used to supplement revolving doors.

J. In locations where strong winds occur for long duration, consider installing wind screens to protect external doors from direct blast of prevailing winds. Screens can be opaque, constructed cheaply from concrete block, or can be transparent, constructed of metal framing with armored glass. Careful positioning is necessary for infiltration control.

K. Where practical, cover all window and through-the-wall cooling units when not in use. Specially designed covers can be obtained at relatively low cost.

L. Insulate all ductwork carrying conditioned air through unoccupied spaces with at least 1" to 1-1/2" of fibrous insulation or its thermal equivalent.

M. Reduce or eliminate the need for using outdoor air for odor control by installing chemical or activated charcoal odor-absorbing devices.

N. Modify duct systems and hoods to introduce unheated outdoor or return air directly to the exhaust hood. Weigh this against changing hoods to new high velocity hoods which require less make-up air.

O. Acquire the services of a temperature control expert to check and adjust all system controls and to recommend modifications.

P. Install an automation system to operate the ventilation units so that supply air temperature and return air/fresh air dampers can be adjusted to maintain the desired space temperature in the room.

Q. Wire all remote control panels into one central panel.

R. Adjust or replace all supply air temperature gauges so that accurate ventilation temperatures can be read and maintained.

S. In existing systems where throttling is necessary (being practiced) to control flow, revise fan drive or trim pump impeller for required flow with no throttling.

T. Replace outside air dampers with low leakage type.

U. Consider adding controls to shut down the ventilation system whenever a building, such as nurses' quarters, is closed for an extended period of time, except when the economizer cycle is in use.

V. Modify duct systems and hoods to introduce unheated outdoor or return air directly to the exhaust hood in kitchens and laundries.

W. Install tight fitting storm windows where practical.

X. Consider installing automatic door closers on all doors leading to the exterior or unconditioned spaces.

Y. If the building has a garage but does not have a garage door, consider installing one, preferably motorized to enable easier opening and closing.

Z. Consider use of a card-key, key, or radio frequency operated garage door which stays closed at all times except when in use.

AA. Consider installation of an air curtain, especially in delivery areas. The device prevents penetration of unconditioned air by forcing a layer of air of predetermined thickness and velocity over the entire entrance opening. An expert in the field should be consulted before obtaining such a device, especially when high-rise or cross flow of air exists.

BB. Consider heat recovery or exchange between make-up and exhaust air.

CC. If a large occupant load is involved, consider installing remotely adjustable outside air dampers. These permit outside air volume to be adjusted in approximate proportion to current occupancy.

DD. Modify duct systems and hoods to introduce unheated outdoor or return air directly to the exhaust hood. Weigh this against changing hoods to new high velocity hoods which require less make-up air.

EE. Add controls to shut down the ventilation system whenever the building is closed for an extended period of time, as during the evening, weekends, etc., except when the economizer cycle is in use.

FF. Reduce system resistance to air flow to a minimum by:

1. Replacing those duct sections and fittings which impose unnecessary resistance on the system.

2. Replacing dirty filters with adequately sized filter media which has a high efficiency and low air flow resistance.

3. Removal of unnecessary dampers and other obstructions from ductwork and replacing high resistance inlets and outlets with modern grilles and diffusers providing low resistance.

GG. Ventilate attic space by natural draft or power ventilation. Provide positive shut-off of ventilation when it is not beneficial.

II. HEATING AND COOLING SYSTEM

A. Install Flue Gas Analyzer: Optimum combustion efficiency varies continuously with changing loads and stack draft. Accordingly, maintaining optimum combustion efficiency requires continuous adjustment of fuel/air ratios. This can be achieved through installation of a flue gas analyzer which provides continuing information on flue gas temperature and carbon dioxide or oxygen content, thus enabling manual adjustment on a continuing basis. The specific type of flue gas analysis instrumentation required depends upon the type installation involved. Due to the increasingly more widespread need for multi-fuel burners, however, oxygen analysis is considered to be the single most useful criterion for all fuels since the oxygen-to-total air ratio varies within narrow limits. The cost of labor required to make the continuing adjustments should be compared to the cost of equipment that makes the adjustments automatically.

B. Preheat Oil To Increase Efficiency: Preheating oil can increase efficiency by as much as 3% depending on the particular constituents of the oil involved. Heat required to attain complete automization can be obtained through use of reclamation procedures discussed below. Heating oil beyond 135°F for #4 oil, 185°F for #5, or 210°F for #6 will increase efficiency even more, except care must be taken not to overheat, which would cause vapor locking and flame-out. Recommendations of the oil supplier should be followed.

C. Isolate Off-Line Boilers: Light heating loads on a multiple boiler installation are often met by one boiler on line with the remaining boilers idling on stand-by. Idling boilers consume energy to meet stand-by losses. In many cases, these losses are increased by a continuous induced flow of air through the idling boilers and up the chimney. Unless a boiler is about to be used to meet an expected increase in load, it should be secured and isolated from the heating system (by closing valves) and from the stack and chimney (by closing dampers). A large boiler can be fitted with by-pass valves and regulating orifice to allow the minimum flow required to keep it warm and avoid thermal stress when it is brought on-line again. If a boiler waterside is isolated, it is important to prevent backflow of cold air through the stack which could cause the boiler to freeze.

D. Replace Existing Boilers with Modular Boilers: Most boilers achieve maximum efficiency only when running at their rated output. In most cases, however, full boiler capacity is seldom required because heat load is 60% or less of full load 90% of the time. As a result, large capacity boilers in single units operate intermittently for the major part of the heating season. Although high-low firing capabilities may reduce cycling, the boilers can only reach their design efficiency for short periods resulting in low seasonal efficiencies. A modular boiler system comprising two or more small capacity boiler units will increase seasonal efficiency. Each module is fired at 100% of its capacity only when required. Fluctuations of load are met by firing more or fewer boilers. Each small capacity unit has low thermal inertia (providing rapid response and low heat-up and cool-down losses) and either

will be running at maximum efficiency or will be turned off. In a typical installation where single unit large capacity boilers are replaced by modular boilers, boiler seasonal efficiency may be improved from 68% to 75%. This represents a 9% savings of present fuel consumption. Use of the modular approach is particularly worthwhile in cases where the present boiler plant is at or near the end of its useful life. Replacement modular boilers should be sized to meet the reduced heating load resulting from implementation of other measures.

E. Preheat combustion air to increase boiler efficiency. Preheating primary and secondary air increases boiler efficiency by reducing the cooling effect when the air enters the combustion chamber and by promoting more intimate mixing of fuel and air. It is estimated that each 100°F increase in combustion air temperature increases boiler efficiency by 2%. Combustion air can be preheated up to 350°F for stoker-fired coal, oil and gas. The maximum temperature permissible is determined by the type of construction involved and the materials of the firing equipment. Several sources of heat are available to perform preheating. As an example, ambient air in most boiler rooms is heated incidentally by boiler and pipe surfaces and collects below the ceiling. This air can be utilized directly as preheated combustion air by ducting it down to the firing level and directing it into the primary and secondary air intakes. Other methods available involve recovering waste heat from boiler stacks, condensate blowdown hot wells, and other sources. Manufacturer's recommendations should be followed in all cases.

F. Reduce blowdown losses. Blowing down a boiler has two purposes: (1) to maintain a low concentration of dissolved and suspended solids in the boiler water, and (2) to remove sludge in the boiler to avoid priming and carryover. There are two principal types of blowdown: intermittent manual blowdown and continuous blowdown. Manual blowdown (or sludge blowdown) is necessary whether or not continuous blowdown is installed, with frequency depending upon the amount of solids in the boiler make-up water and the type of water treatment used. Continuous blowdown results in a steady energy drain because make-up water must be heated. In either case, blowdown energy losses can be minimized by installing automatic blowdown controls and heat recovery systems. Automatic blowdown controls monitor the conductivity and pH of the boiler water periodically and blowdown the boiler only when required to maintain acceptable water quality. Further savings can be realized if the blowdown water is piped through a heat exchanger or a flash tank with a heat exchanger. In this way, for example, heat from the boiler blowdown flash tank can be used for feed water heaters.

G. Replace boilers at or near end of useful life. A boiler at or near the end of its useful life should be replaced by a modern version which is matched to current and projected needs of the installation involved. In most cases new boilers on the market can obtain 80% efficiency. Even more efficiency can be gained by specifying multiple boilers. Replacement burners should be selected on the basis of long-term cost rather than first cost. Increased cost of fuel, labor and materials should be considered in developing long-term cost projections. Also consider installation of a dual-fuel system to avoid problems in the event of any shortages or curtailments.

H. Install boiler stack economizer. A boiler stack economizer is a simple heat exchanger placed inside the exhaust stack which uses boiler feed water as the transfer medium. Heat captured from the exhaust gasses increases the temperature of the feed water distributed to the boiler. In the past years, this technique was limited to systems using low or nonsulphur content fuels to avoid build-up caused when the economizer cooled exhaust gases to the sulphur dew point. Newer systems overcome this problem by incorporating a solid-state control which keeps stack temperatures above the dew point by controlling the volume of feed water passing through the transfer coils.

I. If the boiler is large enough to require a licensed operator, then the boiler control system is complex enough to greatly affect the efficient operation of the boiler. As the boiler control system approaches 10 years in age, the potential for defective operation from worn-out controls increases, and it may be possible to save energy by replacing it with a new control system. If the present controls are worn, a new system could increase the efficiency of the boiler system.

J. Replace old, inefficient oil burners with new, efficient ones. Changing a 60% unit for a 75% one with a 25,000 gallon per year experience will save 5,000 gallons.

K. Install loading dock door seals. While it may not be possible to completely seal off such an opening, the effort to do so is rewarding in energy savings.

L. Insulate hot, bare heating pipes. A 160°F, bare hot water pipe 1-1/2 inches in diameter, un-insulated, will lose 13 million BTU/year for each 10' length.

M. Increase the amount of insulation installed on hot water pipes and storage tanks or replace existing insulation with a type having better thermal properties.

N. Replace all damaged insulation on heating pipes, including those in steam, condensate, hot water supply, and hot water return systems.

O. Repair all steam leaks on steam lines. Should a leak of 3/16" size in a 30 PSIA steam line be found, an annual cost of nearly $1,000 is accumulated.

P. If boilers are used as the primary heat source for domestic hot water, install a boiler to match the load rather than use an oversized heating boiler all summer.

Q. Use waste heat for water heating. If heat is available from the boiler flue or the chiller, the hot water may be preheated by appropriate heat exchangers.

R. Install key-lock plastic covers over thermostats to prevent building occupants from adjusting settings.

S. Inspect boiler door gaskets. Replace them if they do not provide a tight seal.

T. Inspect locations of thermostats. Relocate if they currently are positioned near outside walls, in areas that are seldom used, or if they are subject to outside drafts.

U. Install automatic steam control valves on radiators to reduce the need for opening windows in rooms that overheat.

V. Have a competent combustion engineer make a flue gas analysis once each month to properly adjust the fuel input and to check combustion.

W. Provide Chemical Treatment of Boiler Water: Proper chemical treatment of boiler water will reduce scale build-up, protect the boiler, and help protect condensate returns.

X. Connect all of the manual day-night control switches to timeclocks so night setback temperatures can be achieved even if inadvertently left on "day".

Y. Use spot heaters and/or coolers in spaces having large volume and/or low occupancy.

Z. Install new or recalibrate existing stack temperature gauge.

AA. Connect the space heating hot water pumps to the timeclock so they will only operate when the boiler is on line.

BB. Install thermostats for control of all heating equipment where none currently exist.

CC. Add insulation to existing pipes, ducts, tanks, etc.

DD. Install automated damper controls to provide positive draft shut-offs when the boiler is not operating.

EE. Develop heating system standard operating procedures.

FF. Add controls to enable up to 100% shut-down of air and water to unoccupied space.

GG. Route vents from steam system flash tanks back into low pressure steam mains.

HH. Build penthouse type enclosures around rooftop units to reduce radiation and wind losses from exposed ducts.

II. Install turbulators in boiler tubes to increase the heat transfer from the hot gases to the waterside.

JJ. Replace inefficient boilers, e.g., replace single pass with new, unless heat can be reclaimed from the stack.

KK. Insulate existing underground heating lines where existing piping is in good condition but where conduit and/or piping insulation has failed.

LL. Convert to a low pressure system to improve the heating system annual operating efficiency. The installation of small steam electric boilers near the termination of some steam lines may reduce the need for piping modifications.

MM. If electric heating is contemplated, use heat pumps rather than direct resistance heating.

NN. Use heat pumps (both water/air and air/air) if a continuous source of low-grade heat exists near the building, such as a lake, river, etc.

OO. Replace inefficient air conditioners. Newer units may save as much as 25% or more on the energy consumed for the same cooling.

PP. Consider converting systems serving interior zones to variable volume. Conversion is performed by blocking off the hot deck, removing or disconnecting mixing dampers, and adding low pressure variable volume terminals and pressure by-pass.

QQ. Consider installing interlocks between the heating and cooling systems of each unit to prevent simultaneous heating and cooling.

RR. If self contained units are relatively old, consider replacing them with more efficient air-to-air heat pumps or similar units having a higher energy efficiency rating.

SS. Install insulation on all hot and chilled water pipes, fittings and valves passing through unconditioned spaces to minimize heat losses and heat gains.

TT. Concentrate routing of heat to entrances to counter admission of cold air.

UU. Incorporate an economizer cycle in the A/C system. Installations to utilize 100 percent outdoor air for cooling purposes wherever possible in lieu of operating the refrigeration equipment.

VV. Utilize humidifiers to maintain higher humidity levels providing comfort at lower temperatures.

WW. Redesign high heat loss areas, including loading docks, vestibules and automotive centers.

XX. Install zone thermostat controls.

YY. Institute an operating procedure for multiple boiler plants to ensure maximum loading of one boiler before a second boiler is put into service.

ZZ. Use the run-around, air-to-air regenerative heat recovery wheels or heat pipes to reduce air conditioning and heating loads due to make-up air.

AAA. Use single stage evaporative coolers as pre-cooler for outside air make-up in air conditioning systems in arid zones.

BBB. Use air cooled condensers in series with cooling towers to minimize equipment sizes and reduce electrical consumption. Use a small cooling tower in series with a large air cooled condenser for peak saving particularly in arid zones.

CCC. Insulate air conditioning supply ducts passing through non-conditioned spaces and above suspended ceilings.

DDD. Consider conversion of chilled and hot water pumping systems from constant volume to variable volume.

EEE. Install a three-way valve on the chilled water coil at each air handling unit. Reset the cold deck temperature by one of the following means:

1. Report each space thermostat requirement and select the cold deck temperature that will satisfy the thermostat with the greatest call for cooling. Reset the hot deck temperature from the steam valve with the thermostat that has the greatest call for heating. This method will give very good occupant comfort, but in general is found to have some difficulty with one or more zones calling for maximum heat or maximum cooling when something less would do.

2. Select specific representative thermostats to report conditions and reset in the manner described above.

3. Use selected thermostats to provide a source to be averaged and let the averaging device reset the hot and cold deck temperatures. This method has a good opportunity to provide minimum heating and cooling requirements at some expense of occupant comfort.

4. Reset hot and cold deck temperatures from the central control system using input of space temperature, outside temperature, solar effect, wind velocity, weather forecast, etc.

FFF. In combination with a variable speed pumping system within the building, install a two-way valve at the chilled water coil of air handling units. Control the hot and cold deck reset by one of the methods outlined in paragraph EEE, above.

GGG. Consider the modification of building air side equipment from constant volume to variable volume. This may be done in a number of ways. Some representative methods are noted below:

1. Replace existing double duct mixing box with new variable volume double duct mixing box.

2. Install a variable volume, single duct box on the cold duct inlet to the existing double duct unit for making the cold deck variable volume.

3. Modify air handling unit by installing discharge dampers, inlet vanes, electro-magnetic drive, or letting the fan ride up the fan curve as pressure increases. Riding up the fan curve may not be satisfactory on systems where the volume reduction is large.

HHH. When units served by a multi-zone system have wide variations in load, consider installing individual zone heating coils in the multi-zone discharge ducts rather than one coil in the unit. The control sequence should go from full cooling through the cold coil to full by-pass air through the hot deck and then the control valve on the hot water coil should beging to open until finally it supplies full heat. Monitor and control the full ventilation cycle on this type of system to ensure that reheat energy does not exceed cooling energy requirements at temperatures below 45°F.

III. If not damper exists, install a felt-lined damper with a remote or local control device and timer control.

JJJ. Investigate the possibility of converting the system to variable (step-controlled) volume operation by adding the necessary controls.

KKK. Convert to coal as a heating fuel, if you can get it in sufficient quantity and quality. Retain capability of buring oil and/or natural gas as alternate fuels, as insurance. Check with appropriate EPA regulations and code requirements to see if high sulfur coal will be permitted before ordering same. Get approvals in writing.

LLL. Install permanent split capacitor motors in room fan and coil units when it is necessary to replace existing motors.

III. LIGHTING SYSTEMS

A. Relocate luminaires to provide light on task areas at an angle outside the zone which causes veiling reflections if relocation of work station is impractical.

B. Replace outdated or damaged luminaires with modern luminaires which have good cleaning capabilities and which use lamps with higher efficiencies and good lumen maintenance characteristics.

C. Consider installing fluorescent luminaires with multiple level ballast, two level switching or adding solid state dimming controls for

incandescent luminaires in multiple-purpose spaces which require more than one level of illumination.

D. Consider lowering luminaires so they will provide recommended illumination levels on the task area at reduced wattage.

E. Where appropriate, consider installation of lenses which provide special light distribution patterns to increase lighting effectiveness. As examples, linear batwing, radial batwing, parabolic louvers or polarizing lenses may provide better visibility with the same or even reduced wattage. It is suggested that competent technical advice be obtained to evaluate where (and if) such lenses can be used effectively.

F. Replace all incandescent parking lighting with mercury vapor H.I.D. lamps and fixtures.

G. Lower the ceilings or mounting height of luminaires to increase the level of illumination with less wattage.

H. Illuminate specific task areas to that level, for each area, which provides adequate lighting to perform the required task satisfactorily and reduce illumination levels in adjacent areas.

I. Remove lamps or fixtures. If only lamps are removed, disconnect ballasts since a ballast accounts for ten to thirty percent of the lamp's power drain.

J. Eliminate exterior lighting except where lighting is to be used for the purpose of identifying the building entrances and/or for security.

K. Replace incandescent street lights with HID lamps and ballasts, which are more efficient and produce more light with less energy.

L. Reduce parking lot lighting to minimum safety requirements; access to certain lots may be prohibited (entrances, exits barred) during evening hours so that all lighting can be eliminated in those areas.

M. Remodel light switches in all classrooms to provide for key operations so they can be shut off after class and only turned on again by individual with key.

N. Remodel lighting switches in auditoriums, other large lecture halls, to provide for on-off operation by faculty.

O. Remodel lighting switches where large bays of lights are on one switch so only lights needed in a specific work area can be turned on. Have master switch as override for the individual switches.

P. Install time devices or photoelectric cells to turn lights on and off automatically, particularly exterior lights.

Q. Eliminate can down lights. Poor lighting and very frequent bulb replacement.

R. Shade exterior transformer banks from solar radiation to prevent heat build-up and resultant losses.

S. Ventilate transformer banks to keep them as cool as possible.

T. Provide selective switching. Initial cost economics and lack of knowledge about final space subdivision often lead to the use of central panelboards as the only means of controlling large blocks of lighting. This design approach precludes the potential for turning on only the amount of lighting actually needed after the space has ben subdivided.

U. Investigate ways to provide local control of lighting. Localized switches can be provided near panelboards to control groups of lights. Low voltage control circuits can be used to provide local control of switches located in remote locations. These controls usually are relatively inexpensive. When properly used, localized switching usually will save enough energy to provide a pay-back on the investment within a short period of time.

V. The use of modern "plug in" or "modular" wiring systems may prove to be economical and energy efficient especially in those areas where future use is undetermined, or is subject to frequent change. These systems permit plugging in of light fixtures and switch legs at any point in the system, thereby providing the capability for truly task orientated lighting.

W. Use three phase transformers particularly in large substations to reduce transformer losses.

X. Use higher voltage motors to reduce initial cost of electrical service and equipment. The proper choice of such motors can improve power factor.

Y. Where possible, consideration should be given to carrying high voltage electric current to the load centers where it is required. 12,500 or available power volt current nearest its point of use will reduce voltage drop, permit smaller wiring and conserve power.

Z. A low power factor on an electrical system within a building will increase the losses in the electric utility system and reduce the system's capacity. Many electric utility companies have a penalty charge for low power factor. Correcting power factor can provide for more efficient use of energy as well as a reduction in the cost of electricity. Electrical devices known as capacitors can be installed to correct low power factor.

IV. WATER SYSTEMS

A. Consider installing self-closing faucets for hot and cold water in public restrooms.

B. Remove or turn off domestic hot water to toilet rooms and other spaces that could function without hot water. Consider replacing free running drinking fountains with spigot types which utilize a paper cup. Up to half the water drawn by free running fountains is wasted.

C. Install single tap at wash basins that will provide water at a tepid temperature, except for food service and others involving health or research services.

D. Install shower head restrictors. This may save up to 50% of the hot water consumed.

E. Changing the shower heads from the existing GPM rating to 2 GPM.

F. Install a small domestic water heater to maintain the desired temperature in the water storage tank to eliminate the need for running one of the large space heater boilers at a very low efficiency during the summer months.

G. Use a single system to meet handwashing needs in toilets.

H. Meet hot water heating needs from:

1. Waste heat from incinerators.

2. Rejected heat of compression from refrigeration units.

3. Waste condensate return from steam operated systems.

I. Arrange circulating pipework to minimize the length of dead legs connecting to faucets.

J. If boilers are used as the primary heat source for domestic hot water, install a boiler to match the load rather than use an oversized heating boiler in summer.

K. Consider relocating the water heater as close to the point of use as possible. The longer the run, the more hot water that sits in it - cooling down - between periods when hot water is drawn.

L. Consider replacing existing hot water faucets with spray type faucets with flow restrictors where practical.

M. If water pressure exceeds 40 to 50 pounds, install a pressure reducing valve on the main service to restrict the amount of hot water that flows from the tap.

N. Avoid the use of resistance electric heating for hot water; consider using a heat pump or waste heat.

V. UTILITY PLANT AND DISTRIBUTION SYSTEM

A. Install Flue Gas Analyzer: Optimum combustion efficiency varies continuously with changing loads and stack draft. Accordingly, maintaining optimum combustion efficiency requires continuous adjustment of fuel/air ratios. This can be achieved through installation of a flue gas analyzer which provides continuing information on flue gas temperature and carbon dioxide or oxygen content, thus enabling manual adjustment on a continuing basis. The specific type of flue gas analysis instrumentation required depends upon the type installation involved. Due to the increasingly more widespread need for multi-fuel burners, however, oxygen analysis is considered to be the single most useful criterion for all fuels since the oxygen-to-total air ratio varies within narrow limits. The cost of labor required to make the continuing adjustments should be compared to the cost of equipment that makes the adjustments automatically.

B. Consider control valve(s) that will restrict the flow to any one building by regulating the inetl pressure to the building or by actually measuring and regulating the flow to be no greater than the maximum design flow for the building.

C. When installing new or replacement water chillers, consider selection of the most energy conserving chiller available.

D. Consider new and innovative methods of providing chilled water, such as using gas engine driven electric generators to provide variable frequency power to electrically driven chillers.

E. Consider modifications to gas piping on existing centrifugal water chillers to reduce friction between stages or at the outlet of the compressor.

F. Consider using cooling tower water in place of chilled water in the cooling circuit when outside dry bulb and wet bulb conditions are such that cooling may be provided in this manner. There is a patented system called "Strainer Cycle" which pushes this concept. It is also possible to do it without their interaction. This system is a substitute for a full ventilation cycle and in the case of double duct and multi-zone systems, it may produce an overall energy saving.

VI. OTHER PROJECTS

A. Choose new equipment with energy saving criteria in mind.

B. Install timers for kichen equipment to automatically control cooking time.

C. Install rigid insulation between metal panels below windows.

D. Install timers to turn off lights and equipment automatically.

E. Install timers to turn off large equipment when the building is not occupied.

F. Be sure operable windows have sealing gaskets and cam latches.

G. Cover and insulate the upper half of the windows to reduce heat loss.

H. Insulate all roofs, walls and floors with an exterior exposure.

I. Reinsulate the ceiling with some type of spray-on insulation. It might also be possible to consider blowing a mineral wool insulation on the top of the ceiling plenum or batt type between ceiling joists.

J. Where floors are over unheated spaces, such as a garage, consider suspending a ceiling beneath the open floor beams with batt insulation.

K. Provide vestibules with self-closing weatherstripped doors.

L. Use heat pumps in place of electrical resistance heating and take advantage of the favorable coefficient of performance.

M. Insulate penthouse room metal walls to reduce heat loss.

N. Install localized water heaters in restaurants, snack bars, and beauty parlors.

O. Investigate relay or computer controls over power supply and schedule.

P. Investigate the burning of trash to convert heat to steam for distribution.

Q. Install storm windows or double glaze windows throughout. A single pane 36 square foot window will save about 3.5 million BTU per year with storm windows added.

R. Add insulation to the roof whenever the roof is going to be resurfaced or repaired. If no insulation is already in place, don't wait - put insulation on immediately.

S. Consider adding reflective and/or heat absorbing film to glazing to reduce solar heat.

T. Use awnings and exterior window shading devices. Shading of windows and exterior wall areas reduces the temperature of such surfaces, and therefore the interior cooling load.

U. Cover unused windows with insulating materials.

V. Install a campus wide central control system (this item is covered in Part VII, Controls).

W. Install capacitors switched with motors 40 hp and above when the utility has a power factor penalty in the electric rate.

X. As utility rates continue to increase, consider solar assisted systems for:

1. Swimming pools.
2. Domestic hot water.
3. Heat pump assisted space heating.
4. Hot water space heating.

DEFINITIONS AND ENERGY CONSTANTS

This section contains a list of definitions which, together with those provided in the Federal Regulations, will clarify many technical and legalistic terms contained in this manual.

DEFINITIONS

NOTE: For a complete list of definitions, see THE FEDERAL REGISTER, Volume 44, No. 64, (April 2, 1979), Paragraph 450.41, Page 19351. The following definitions are supplemental to that list.

Absorption Chiller: A refrigeration machine using heat as a power input to generate chilled water.

Air Changes: Expression of ventilation rate in terms of room or building volume. Usually air changes per hour.

Alternate Energy Source: A non-depletable energy source such as solar, geothermal, wind, etc.

Ambient: Surrounding (i.e., the ambient temperature is the temperature in the surrounding space).

Average Occupancy: The number of people in a building over a 24-hour period.

Ballast: A device used in starting circuit for fluorescent and other types of lamps.

Blow Down: The discharge of water from a boiler or cooling tower sump that contains a high proportion of total dissolved solids.

British Thermal Unit (BTU): A heat unit equal to the amount of heat required to raise one pound of water one degree Fahrenheit.

Building Envelope: All external surfaces which are subject to climate impact; for example, walls, windows, roof, floor, etc.

Centrifugal Chiller: A refrigeration machine using mechanical energy input to drive a centrifugal compressor to generate chilled water.

Centrifugal Fan: A device for propelling air by centrifugal action. Forward curved fans have blades which are sloped forward relative to direction of rotation. Backward-curved fans have blades which are sloped backward relative to direction of rotation. Backward-curved fans are generally more efficient at high pressure than forward-curved fans.

Coefficient of Utilization: Ratio of lumens on work plane to lumens emitted by lamps.

Cold Deck: A cold air chamber forming part of a ventilating unit.

Condensate: Water obtained by changing the state of water vapor (i.e. steam or moisture in the air) from a gas to a liquid, usually by cooling.

Condenser: A device for accomplishing condensation.

Cooling Degree Days: The annual sum of the number of Fahrenheit degrees of each day's mean temperature above 65° F.

Cooling Tower: A device that cools water directly by evaporation.

Damper: A device used to vary the volume of air passing through an air outlet, inlet, or duct.

Degree Day: The difference between the median temperature of any day and 65° F., when the median temperature is less than 65° F.

Degree Hour: The difference between the median temperature for any hour and selected datum.

Demand: The maximum connected load of power that a utility is prepared to supply from its facilities. The demand rate reflects the premium that the company charges to cover the peak load draw, as well as the investment in the equipment it must make to do so. Demand billing schedules are usually adjustable if the customer does not use this peak load over a specific period, which varies from one month to one year.

Direct Expansion: Generic term used to describe the refrigeration systems where the cooling effect is obtained directly from the refrigerant (e.g., refrigerant is evaporated directly in a cooling coil in the air stream.)

D.O.E: The Department of Energy

Double Bundle Condenser: Condenser (usually in refrigeration machine) that contains two separate tube bundles, allowing the option of either rejecting heat to the cooling tower or to another building system requiring heat input.

Dry Bulb Temperature: The measure of the sensible temperature of the air.

Economizer Cycle: A method of operating a ventilation system to reduce refrigeration load. Whenever the outdoor air conditions are more favorable (lower heat content) than return air conditions, outdoor air quantity is increased.

Efficacy of Fixtures: Ratio of usable light to energy input for a lighting fixture or system (lumens/watt).

Energy Conservation Measure(ECM): An installation or modification to an existing building primarily intended to reduce energy consumption or allow for the use of alternate energy sources. (See The Federal Register for a more detailed definition.)

Energy Conservation Project (ECP): A group of related Energy Conservation Measures within a building.

Evaporator: A heat exchanger which adds latent heat to a liquid, changing it to a gaseous state. In a refrigeration system, it is the component which absorbs heat.

Footcandle: Energy of light at a distance of one foot from a standard candle.

Heat Gain: As applied to HVAC calculations, it is the amount of heat gained by a space from all sources, including people, lights, machines, sunshine, etc. The total heat gain represents the amount of heat that must be removed from a space to maintain indoor comfort conditions.

Heat Loss: The sum cooling effect of the building structure when the outdoor temperature is lower than the desired indoor temperature. It represents the amount of heat that must be provided to a space to maintain indoor comfort conditions.

Heat, Latent: The quantity of heat required to effect a change in state.

Heat, Sensible: Heat that results in a temperature change but no change in state.

Heat, Specific: Ratio of the amount of heat required to raise a unit of mass of material one degree to that required to raise a unit mass of water one degree.

Heat Pump: A refrigeration machine possessing the capability of reversing the flow so that its output can be either heating or cooling. When used for heating, it extracts heat from a low-temperature source to the point where it can be used.

Hot Deck: A hot air chamber forming part of a ventilation unit.

Humidity, Relative: A measurement indicating moisture content of air.

Infiltration: The process by which outdoor air leaks into a building by natural forces through cracks around doors and windows, etc. (Usually undesirable.)

Luminaire: Light fixture designed to produce a specific effect.

Make-Up Water: Water supplied to a system to replace that lost by blow down, leakage, evaporation, etc.

NECPA: The National Energy Conservation Policy Act.

Outside Air: Air taken from outdoors and therefore not previously circulated through the system.

PEA: Preliminary Energy Audit.

Seasonal Efficiency: Ratio of useful output to energy input for a piece of equipment over an entire heating and cooling season. It can be derived by integrating part load efficiencies against time.

Ton of Refrigeration: A means of expressing cooling capacity. 1 Ton = 12,000 BTU's/cooling hour.

"U" Value: A coefficient expressing the thermal conductance of a composite structure in BTU's per square foot hour degree F. temperature difference.

Vapor Barrier: A moisture-impervious layer designed to prevent moisture migration.

Ventilation Air: That portion of the supply air which comes from outside that has been treated to maintain the desired quality of air within a designated space.

Wet Bulb Temperature: The lowest temperature attainable by evaporating water in the air without the addition or subtraction of energy.

Zone: An area composed of a building, a portion of a building, or a group of buildings affected by a single device or piece of equipment.

ENERGY CONSTANTS AND CONVERSIONS

KWH	-	Kilowatt Hours = 1 Thousand Watt-Hours
BTU	-	Unit of Energy
MBTU	=	1×10^3 BTU = 1 Thousand BTU's
MMBTU	=	1×10^6 BTU - 1 Million BTU's
CF	-	Cubic Feet (natural gas or water)
CCF	-	Hundreds of Cubic Feet
MCF	-	Thousand of Cubic Feet
1 Ton	-	Air Conditioning Capacity (12,000 BTU per hour)
1 Ton-Hour	=	12,000 BTU
HVAC	-	Heating, Ventilating, and Air Conditioning
HVAC System	-	means all heating and air conditioning equipment including fans, pumps, compressors, etc.

BLANK ECC, PEA, AND EA FORMS

Included in this section are blank forms from which the auditor may make copies.

(a) BUILDING NAME AND I. D. NUMBER _____ (c) FISCAL YEAR _____

(v) METER TYPE: K. W. _____ KVAR _____ DEMAND PERIOD:

ELECTRICITY:

KWH _____ OTHER _____ 15 Min. ____ Other ____ Min.

MONTH	10^3 GROSS SQ. FT. BUILDING SIZE (d)	DAYS IN BILLING PERIOD (e)	DEMAND KVA (f)	DEMAND P.F. (g)	DEMAND KW (j)	DEMAND CHARGE $ (k)	10^3 KWH (l)	LOAD FACTOR (m)	FUEL COST ADJUST. $ (n)	TOTAL CHARGES $ (o)	COST PER KWH ¢ (p)	10^6 BTU TOTAL (Nearest whole number) SITE (r)	10^6 BTU TOTAL (Nearest whole number) SOURCE (s)	10^3 BTU PER SQ. FT. SITE (t)	10^3 BTU PER SQ. FT. SOURCE (u)
SEPTEMBER															
OCTOBER															
NOVEMBER															
DECEMBER															
JANUARY															
FEBRUARY															
MARCH															
APRIL															
MAY															
JUNE															
JULY															
AUGUST	**	*	AVG.	AVG.	AVG.	*$	*	AVG.	*$	*	¢AVG.	*	*	*	*

*ANNUAL TOTALS in KWH
**Same as August Entry

ANNUAL PEAK DEMAND: _____

(m) = (l) ÷ [(j) x (e) x 24 hrs.]
(r) = (l) x 3.413
(s) = (l) x 11.60

(t) = (r) ÷ (d)
(u) = (s) ÷ (d)
(p) = (o) ÷ [(l) x 1000]

NAME OF ELECTRIC UTILITY: _____
ADDRESS: _____
TELEPHONE: _____
CONTACT: _____
ELECTRIC RATE DESIGNATION: _____

ANNUAL ELECTRIC COST PER SQ. FT. = ANNUAL TOTAL (o) ÷ (d) x 1000 _____

ANNUAL ELECTRIC COST/MMBTU (1,000,000 BTU) = ANNUAL TOTAL (o) ÷ ANNUAL TOTAL (r) = _____ (COST AT SITE)

FORM ECC-1 2/79 Rev. 3/79

(a) BUILDING NAME AND I. D. NUMBER

FISCAL YEAR (c)

NATURAL GAS:

(b) HEAT CONTENT (at site) _____ BTU PER CU. FT.

MONTH	10^3 GROSS SQ. FT. BUILDING SIZE (d)	DAYS IN BILLING PERIOD(e)	BILLED M C F (f)	FUEL COST ADJUST. $ (g)	TOTAL CHARGES $ (h)	COST PER M C F $ (j)	10^6 B T U TOTAL SITE (k)	10^6 B T U TOTAL SOURCE (l)	10^3 B T U PER SQ. FT. SITE (m)	10^3 B T U PER SQ. FT. SOURCE (n)	FUEL COST ¢ PER SQ. FT.(o)	FUEL COST PER MMBTU $ SITE (p)	
SEPTEMBER													
OCTOBER													
NOVEMBER													
DECEMBER													
JANUARY													
FEBRUARY													
MARCH													
APRIL													
MAY													
JUNE													
JULY													
AUGUST													
	**	*	*	*$	*$	AVG. $	*	*	*	*	* ¢	$ AVG.	

(j) = (h) ÷ (f)
(k) = (f) x (b) ÷ 1000
(l) = (f) x (b) ÷ 1000 (?) Σ N.D.A.
(m) = (k) ÷ (d)
(n) = (l) ÷ (d)
(o) = (h) ÷ (d) x 1000
(p) = (h) ÷ (k)

* ANNUAL TOTAL
** SAME AS AUGUST

NAME OF GAS UTILITY : _____

ADDRESS: _____

TELEPHONE: _____

CONTACT: _____

GAS RATE: _____

FORM ECC-2 2/79. REV. 3/79

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(a) BUILDING NAME AND I.D. NUMBER _____ METER TYPE: (c) FISCAL YEAR _____

CHILLED WATER and STEAM/HOT WATER (STRIKE ONE)

CHILLED WATER _____ METER MFGR. _____
STEAM _____ METER MFGR. _____
CONDENSATE _____ METER MFGR. _____

FORM ECC-3 2/79 REV. 3/79

MONTH	10^3 GROSS SQ.FT. BUILDING SIZE (f)	DAYS IN BILLING PERIOD (g)	NET BILLED TON-HRS. CHILLED WATER (h)	NET BILLED MBTU STEAM/HW (j)	FUEL COST ADJUST. $ (k)	TOTAL CHARGES $ (l)	10^6 BTU TOTAL SITE (m)	10^6 BTU TOTAL SOURCE (n)	10^3 BTU PER SQ. FT. SITE (o)	10^3 BTU PER SQ. FT. SOURCE (p)	ENERGY COST PER SQ.FT. $ (r)	ENERGY COST $ PER MONTH (TOTAL) SITE (s)	
SEPTEMBER													
OCTOBER													
NOVEMBER													
DECEMBER													
JANUARY													
FEBRUARY													
MARCH													
APRIL													
MAY													
JUNE													
JULY													
AUGUST													
	**	*	*	*	*$	*$	*	*	*	*	*$	$ AVG.	

* ANNUAL TOTAL
** SAME AS AUGUST

(m) = (h) x 8.012 ÷ (j)
(n) = (m) x (1.0+) Factor (7) N.C.A.
(o) = (m) ÷ (f)
(p) = [(m) ÷ (f)] x (1.0+) Factor (7) N.C.A.

(r) = (l) ÷ [(f) x 1000]
(s) = (l) ÷ (m)

NAME OF UTILITY: : _____
ADDRESS: : _____
TELEPHONE: _____
CONTACT: _____
RATES: _____

(a) BUILDING NAME AND I. D. NUMBER _____ (a) FISCAL YEAR _____

(d) FUEL OIL: _____ #2 @ 138,690 BTU/GAL., _____ #6 @ 149,690 BTU/GAL SOURCE BTU/GAL. _____

(e) PROPANE: _____ AT 95,476 BTU/GAL., _____ OTHER _____ BTU/GAL. SOURCE BTU/GAL. _____

MONTH	10^3 GROSS SQ. FT. BUILDING. SIZE (f)	DAYS IN BILLING PERIOD (g)	AMT. BILLED 10^3 GALLONS (h)	FUEL COST ADJUST. $ (j)	TOTAL CHARGES $ (k)	COST Per GAL. $ (l)	10^6 B T U TOTAL SITE (m)	10^6 B T U TOTAL SOURCE (n)	10^3 B T U PER SQ. FT. SITE (o)	10^3 B T U PER SQ. FT. SOURCE (p)	FUEL COST PER SQ. FT. $ (r)	FUEL COST PER MMBTU SITE $ (s)	
September													
October													
November													
December													
January													
February													
March													
April													
May													
June													
July													
August	**	*	*	*$	*$	AVG. $	*	*	*	*	*$	$ AVG.	

* ANNUAL TOTAL - ** SAME AS AUGUST

(l) = (k) ÷ (h) x 1000
(m) = (h) x [(d) or (e) ÷ 1000]
(n) = (m) x (1.0+) factor N.G.A.
(o) = (m) ÷ (f)
(p) = (n) ÷ (f)
(r) = (k) ÷ [(f) x 1000]
(s) = (k) ÷ (m)

NAME OF OIL-PROPANE SOURCE: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT: _____

FUEL RATE: _____

FORM 22E-4 2/79 REV. 3/79

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(a) BUILDING NAME AND I.D. NUMBER _____

(c) FISCAL YEAR _____

OTHER FUEL TYPE:

(d) FUEL NAME: _____

METERING METHOD & MFGR. _____ (p)

BTU CONTENT PER UNIT MEASURE _____ (r)

FORM ECC-5 2/79 REV. 3/79

MONTH	10^3 GROSS SQ. FT. BUILDING SITE (f)	DAYS IN BILLING PERIOD (g)	QUANTITY BILLED (h)	FUEL COST ADJUST. ¢ (j)	TOTAL CHARGES ¢ (k)	COST PER FUEL UNIT ¢ (l)	10^6 BTU TOTAL SITE (m)	10^6 BTU TOTAL SOURCE (n)	10^3 BTU PER SQ. FT. SITE (o)	10^3 BTU PER SQ. FT. SOURCE (p)	FUEL COST PER SQ.FT. ¢ (r)	FUEL COST PER MMBTU SITE ¢ (s)	
SEPTEMBER													
OCTOBER													
NOVEMBER													
DECEMBER													
JANUARY													
FEBRUARY													
MARCH													
APRIL													
MAY													
JUNE													
JULY													
AUGUST													
	**	*	*	*¢	*¢	¢ AVG.	*	*	*	*	*¢	¢ AVG.	

*ANNUAL TOTAL **SAME AS AUGUST

(h) - from billing
(l) = (k) ÷ (h)
(m) = (h) x (t) ÷ 10^6
(n) = (m) x (1.04) Factor (f) N.A.
(o) = (m) ÷ (f)
(p) = (n) ÷ (f)
(r) = (k) ÷ (f)
(s) = (k) ÷ (m)

NAME OF UTILITY CO.: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT: _____

RATE: _____

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(a) BUILDING NAME AND I. D. NUMBER _____

(c) FISCAL YEAR _____

CITY WATER:

(g) METER TYPE: TURBINE _____ POS. DISPL. _____ OTHER _____ METER MFGR. _____

MONTH	HEATING DEGREE DAYS (h)	COOLING DEGREE DAYS (j)	DAYS IN BILLING PERIOD (k)	BILLED CCF				TOTAL CHARGES $ (q)	COST PER CCF $ (r)	CCF PER 1000 SQ. FT. (s)	10^3 GROSS SQ. FT. BUILDING SIZE (t)	
				DOMESTIC (l)	IRRIGATION (m)	PROCESS (n)	TOTAL (o)					
SEPTEMBER												
OCTOBER												
NOVEMBER												
DECEMBER												
JANUARY												
FEBRUARY												
MARCH												
APRIL												
MAY												
JUNE												
JULY												
AUGUST												
	*	*	*	*	*	*	*	* $	* $	*	*	

* ANNUAL TOTAL

CCF = 100 CU. FT. = 748 GAL. = 6235.5 lbs.
1000 Gal = 1.34 C.C.F.

FOR (l), (m), and (n) USE BEST ESTIMATE IF NOT METERED SEPARATELY

(o) = CCF FROM BILLING
(r) = (P) ÷ (o)
(s) = (o) ÷ [(t) x 1000] = CCF/sq.FT.
(s) = (o) ÷ (t) = CCF/1000 sq.FT.

NAME OF CITY WATER UTILITY: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT: _____

RATES: _____

FORM ECC-6 2/79 REV. 3/79

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Return to: Governor's Office of Energy Resources, 7703 N. Lamar, #502, Austin, Texas 78752

PRELIMINARY ENERGY AUDIT

AUDIT DATE: (a1) _____ PAGE 1 OF 6

(a) COMPONENT INSTITUTION NAME & I.D. NO. | (b) BUILDING OR COMPLEX NAME & ID# | # OF BLDGS. | (c) BUILDING ADDRESS

(d) CATEGORY OF BLDG. OR COMPLEX | (e) BUILDING USE CATEGORY | (f) BUILDING OPERATOR NAME, ADDRESS & TELEPHONE

PUBLIC ( ) PRIVATE NON-PROFIT ( ) INDIAN TRIBE ( )

(g) NAME AND ADDRESS OF OWNER

(jj) PEA AUDITOR NAME, ADDRESS & TELEPHONE: _____

I BASIC BUILDING DATA

BUILDING SIZE (h)	OPERATING SCHEDULE							BASIC HVAC CONTROL DATA
	DAYS	TIME PERIOD: HRS/OCCUPANTS/% GSF			(m) PARTIAL USAGE (n)			
		(j) DAYLIGHT	(k) EVE	(l) NITE	QTR	WEEKS	% GSF	
	M-F	/ /	/ /	/ /	1st			CENTRAL BLDG. PANEL (q) YES _____ NO _____
DATE (i) CONSTRUCTED	SAT	/ /	/ /	/ /	2nd			"FCMS" CONNX (s) YES _____ NO _____
	SUN	/ /	/ /	/ /	3rd			
					4th			

II MAJOR ENERGY USING SYSTEMS

PRIMARY HEAT SOURCE (u)	PRIMARY COOLING SOURCE (v)	SPACE TERMINAL HEAT (w)	SPACE TERMINAL COOLING (x)	DOMESTIC HOT WATER SOURCE (y)	INTERIOR LIGHTING SYSTEM (z)	SPECIAL BUILDING SYSTEMS & FACILITIES (aa)
					INCAN. ___%	
					FLUOR. ___%	
					H.I.D. ___%	

III UNIQUE BUILDING CHARACTERISTICS

1. YEAR ROUND, 24 HR. PER DAY OPERATION YES ___ NO ___ (bb)
2. 9 MONTH PER YEAR OPERATION YES ___ NO ___ (cc)
3. SUMMER PROGRAM USE YES ___ NO ___ (dd)
4. EVENING CLASS SCHEDULE YES ___ NO ___ (ee)
5. BUILDING HAS EXTERIOR FLOODLIGHTING YES ___ NO ___ (ff)
6. LIST YEAR & TYPE OF MAJOR BUILDING MODIFICATIONS AND ADDITIONS (gg) _____ TOTAL # OF MAJOR MOD. & ADD. _____
7. OTHER: (hh) _____

FORM PEA-1 4-79 Revised 4/23/79

PRELIMINARY ENERGY AUDIT

FORM PEA-2

(b) BUILDING NAME & I.D. NUMBER _____ (h) BUILDING SIZE (GROSS SQ.FT.) _____

(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER _____

IV ENERGY USE & COST DATA (11) FOR YEAR ENDING AUG. 31 METERED ____ BEST ESTIMATE ____

MONTH	ELECTRICITY			NATURAL GAS			OIL - #2 or # ____			PURCHASED THERMAL				TOTAL ENERGY COSTS $ (xx)
										STEAM-HOT WATER		CHILLED WATER		
	KWH (jj)	COST $ (kk)	$/KWH (ll)	MCF (mm)	COST $ (nn)	$/MCF (oo)	GAL (pp)	COST $ (rr)	$/GAL (ss)	MMBTU OR LBS (tt)	COST (uu) $	TON HRS (vv)	COST (ww) $	
SEPTEMBER														
OCTOBER														
NOVEMBER														
DECEMBER														
JANUARY														
FEBRUARY														
MARCH														
APRIL														
MAY														
JUNE														
JULY														
AUGUST														
ANNUAL TOTALS	①		AVG.	②		AVG.	③		AVG.	④		⑤		

4-79 Revised 5/1/79

ANNUAL ENERGY CONSUMPTION IN BTU'S: (You may round to nearest million)

(1) (yy) Electricity _____ KWH X 11,600 = _____ BTU
(2) (zz) Nat. Gas _____ MCF X 1,030,000 = _____ BTU
(3) (aaa) Fuel Oil #2 _____ GAL X 138,690 = _____ BTU
(4) (bbb) Fuel Oil #6 _____ GAL X 149,690 = _____ BTU
(5) (ccc1) Steam/Hot Water _____ MMBTU X 1,000,000 = _____ BTU
or
(6) (ccc2) Steam _____ LBS X 1,390 = _____ BTU
(7) (ddd) Chilled Water _____ TON HRS X 12,000 = _____ BTU
(8) (eee) _____ X (fff) _____ = _____ BTU
Other Fuel
_____ X (fff) _____ = _____ BTU
Other Fuel

(ggg) TOTAL ANNUAL BTU'S = _____ BTU

ENERGY UTILIZATION INDEX (EUI)

EUI = TOTAL ANNUAL BTU'S / BUILDING GROSS SQ. FT. = BTU's/FT²/YR

EUI = (ggg) / (h)

EUI = (hhh) _____ BTU's/FT²/YR

ENERGY COST INDEX (ECI)

ECI = TOTAL ANNUAL ENERGY COSTS / BUILDING GROSS SQ. FT. = $/FT²/YR

ECI = (xx) TOTAL / (h)

ECI = (iii) _____ $/FT²/YR

(b) BUILDING NAME & I.D. NUMBER

(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

FORM PEA-3

V ENERGY CONSERVATION ACTIVITIES

1. NAME OF ENERGY MANAGER FOR BUILDING: (jjj) _____

2. HAS WORK WHICH PARTIALLY OR FULLY SATISFIES THE REQUIREMENTS OF AN ENERGY AUDIT ON THIS BUILDING BEEN ACCOMPLISHED PRIOR TO THIS "PEA" DATE? _____ YES, _____ NO. (kkk)

3. HAVE ANY DETAILED ENGINEERING STUDIES BEEN CONDUCTED ON THIS BUILDING OR ITS SYSTEMS PRIOR TO THIS "PEA" DATE? _____ YES _____ NO. (lll) IF "YES" NAME SYSTEMS STUDIED. (mmm) _____

4. HAVE ANY ENERGY CONSERVATION MEASURES BEEN CONSIDERED OR IMPLEMENTED ON THIS BUILDING PRIOR TO THIS "PEA" DATE? _____ YES _____ NO. (nnn) IF "YES" LIST THESE MEASURES BELOW WITH ESTIMATES OF THEIR COSTS & ENERGY SAVINGS, IF AVAILABLE:

(ooo) _____ _____

_____ _____

_____ _____

_____ _____

_____ _____

5. GENERAL AUDIT COMMENTS: (ppp) _____ _____

_____ _____

_____ _____

6. DO YOU INTEND TO CONDUCT AN "ENERGY AUDIT" OF THIS BUILDING? (rrr) YES _____ NO _____

4-79

(b) BUILDING NAME & I.D. NUMBER _____ (b1) COMPONENT INSTITUTION NAME & I.D. NUMBER _____

FORM PEA-4 4-79

VI RENEWABLE ENERGY RESOURCE POTENTIAL

1. BUILDING LOCATION: _____URBAN, _____SUBURBAN, _____RURAL AREA. 2. BUILDING HEIGHT: _____STORIES.

3. IS OPEN LAND SUCH AS FIELDS, YARDS, PARKING AREAS, WHICH IS NOT HEAVILY SHADED BY TALL BUILDINGS, TREES, OR OTHER OBSTRUCTIONS AVAILABLE IN THE IMMEDIATE VICINITY OF THE BUILDING? _____YES _____NO.

4. IS APPROXIMATELY ONE-HALF OR MORE OF THE BUILDING'S ROOF AREA OR SOUTHERN ORIENTED WALL SURFACES HEAVILY SHADED BY TREES, SHRUBS, BUILDINGS OR OTHER OBSTRUCTIONS? _____YES _____NO.

5. GENERAL DESCRIPTION OF BUILDING SHAPE: _____SQUARE, _____RECTANGULAR, _____H-SHAPED, _____E-SHAPED. _____T-SHAPED, _____L-SHAPED, _____X-SHAPED, _____Y-SHAPED, _____O-SHAPED.

6. ROOF DATA: _____FLAT, _____PITCHED. IF PITCHED, IS PITCH ORIENTED TO SOUTH? _____YES _____NO.

7. EXISTING ROOF OBSTRUCTIONS: _____NONE, _____CHIMNEYS, _____SPACE CONDITIONING UNITS, _____WATER TOWERS, _____EQUIPMENT PENTHOUSES, _____STAIRWELLS, _____OTHER PERMANENT ROOF MOUNTED STRUCTURES.

8. SOUTH FACING WALL MATERIALS: _____MASONRY, _____WOOD, _____ALUMINUM, _____GLASS, _____STEEL, _____COMBINATION.

9. SOUTH FACING WALL GLASS AREA: _____LESS THAN 25%, _____25-75%, _____MORE THAN 75%.

10. PRIMARY SPACE HEATING SYSTEM: _____OUTSIDE BUILDING, _____INSIDE BUILDING; IF INSIDE BUILDING, IS IT LOCATED _____IN BASEMENT, _____ON GROUND FLOOR, _____ON ROOF? IS INSIDE BUILDING HEATING SYSTEM OF _____CENTRAL TYPE, _____MULTIPLE UNITS, OR _____COMBINATION OF BOTH?

11. PRIMARY DOMESTIC HOT WATER SYSTEM: _____OUTSIDE BUILDING, _____INSIDE BUILDING: IF INSIDE BUILDING IS IT LOCATED _____IN BASEMENT, _____ON GROUND FLOOR, _____ON ROOF? IS INSIDE BUILDING DOMESTIC HOT WATER SYSTEM OF _____CENTRAL TYPE, _____MULTIPLE UNITS, OR _____COMBINATION OF BOTH?

12. ARE ANY OF FOLLOWING ENERGY SOURCES AVAILABLE TO THIS IMMEDIATE BUILDING LOCATION?
(a) YEAR AROUND STEADY, CONSTANT WIND VELOCITIES, 10 MPH MINIMUM _____YES _____NO. (b) NATURAL WATER STREAM OF MINIMUM 10 FOOT HEAD, CONSTANT YEAR AROUND FLOW _____YES _____NO. (c) NATURAL HOT GROUND WATER WELLS (GEOTHERMAL WELLS) _____YES _____NO. (d) SEACOAST TIDES OF 8 FOOT OR GREATER _____YES _____NO. (e) SOURCE OF LOW COST FOREST TIMBER BY-PRODUCTS _____YES _____NO. (F) ANY OTHER RENEWABLE ENERGY SOURCE _____YES _____NO; IF YES, DESCRIBE _____

OPTIONAL

(This Chart is required with TA application for unmetered buildings)

PRELIMINARY ENERGY AUDIT

(b) BUILDING NAME & I.D. NUMBER

(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

VII BUILDING ENERGY SAVING POTENTIAL

(ttt) CHART OF POTENTIAL ENERGY SAVINGS

1.0 ANNUAL ENERGY USE: (SEE EUI PAGE PEA-2)

BTU/SQ.FT./YR.	WF
400,000 AND ABOVE	9
300,000 TO 400,000	8
200,000 TO 300,000	7
100,000 TO 200,000	6
LESS THAN 100,000	5

2.0 RATIO OF OCCUPANCY/SPACE UTILIZATION HOURS TO HVAC EQUIPMENT OPERATING HOURS:

OCCUPANCY/UTILIZATION HRS. / HVAC OPERATING HOURS = RATIO	WF
UNDER 0.20	14.4
0.2 TO 0.4	12.8
0.4 TO 0.6	11.2
0.6 TO 0.8	9.6
0.8 TO 1.0	8.0

3.0 RATED CAPACITY OF HEATING & COOLING EQUIPMENT:

COMBINED HVAC CAPACITY IN BTUH X 10^6	WF
40 AND ABOVE	9
25 TO 40	8
15 TO 25	7
5 TO 15	6
BELOW 5	5

BUILDING MODIFICATION POTENTIAL:

4.1 BUILDING AGE & REMAINING LIFE (R.L.)

	WF
NEW (1-5 YRS) OVER 40 YR. R.L.	3.6
NEW (1-5 YRS) UNDER 40 YR. R.L.	3.2
RECENT (5-15 YRS) OVER 40 YR. R.L.	2.8
RECENT (5-15 YRS) UNDER 40 YR. R.L.	2.4
OLD (OVER 15 YRS)	2.0
OLD (OVER 15 YRS) LESS THAN 5 YR. R.L.	0.0

4.2 TOTAL WALL AREA PERCENT GLASS & INFILTRATION:

% GLASS RANGE	
OVER 40% GLASS	4.5
LARGE INFILTRATION	4.0
UNDER 40% GLASS	3.5
LOW INFILTRATION	3.0
UNDER 15% GLASS	2.5

4.3 LIGHTING LEVELS POTENTIAL REDUCTION:

RANGE	
REDUCED TO 3.0 W/SQ.FT.	6.3
REDUCED TO 2.0 - 3.0 W/SQ.FT.	5.6
REDUCED TO 1.0 - 2.0 W/SQ.FT.	4.9
CAN REDUCE BY SWITCHING CHANGES	4.2
LIGHTING LEVELS CANNOT BE REDUCED	3.5

4.4 PREDOMINANT HVAC SYSTEM:

TYPE	WF
DUAL DUCT OR REHEAT	12.6
MULTIZONE OR INDUCTION UNITS	11.2
ROOFTOP, PACKAGED WALL UNITS, OR UNIT VENTILATION	9.8
FAN-COIL, VAV, OR HEAT/VENT ONLY UNITS	8.4
RADIATION, UNIT HEATERS (NO FAN SYS.)	7.0

4.5 NORMAL OUTSIDE AIR SUPPLY PERCENTAGE:

RANGE	WF
75 TO 100%	8.1
50 TO 75%	7.2
25 TO 50%	6.3
10 TO 25%	5.4
INFILTRATION ONLY WITH TOILET EXHAUST	4.5

4.6 FAN ENERGY:

FAN STATIC PRESS.	GROSS BLDG. SQ.FT./FAN HP	WF
10" OR ABOVE	≤ 200 SQ.FT./HP	5.4
8" SP TO 10" SP	≤ 600 SQ.FT./HP	4.8
6" SP TO 8" SP	≤1000 SQ.FT./HP	4.2
4" SP TO 6" SP	≤1500 SQ.FT./HP	3.6
UNDER 4" SP	≤2000 SQ.FT./HP	3.0

FORM PEA-5 4-79 Revised 5/1/79

OPTIONAL

(This Chart is required with TA application for unmetered buildings)

PRELIMINARY ENERGY AUDIT

(b) BUILDING NAME & I.D. NUMBER

(b1) COMPONENT INSTITUTION NAME & I.D. NUMBER

VII BUILDING ENERGY SAVING POTENTIAL (CONT'D)

CHART OF POTENTIAL ENERGY SAVINGS (Continued)

4.7 HVAC CONTROL SYSTEM:

CONDITION	WF
OUTSIDE AIR & RELIEF DAMPERS HANG OPEN	5.4
INOPERATIVE CONTROLS	4.8
NO WRITTEN PREVENTIVE MAINT. PROGRAM	4.2
CONTROLS ARE SERVICED REGULARLY	3.6
CONTROLS UNDER MAINTENANCE CONTRACT	3.0

4.8 BUILDING PROCESS ENERGY BASE LOAD:

% OF TOTAL LOAD	WF
20% BASE LOAD - COULD REDUCE	2.7
15% BASE LOAD - COULD REDUCE	2.4
10% BASE LOAD - COULD REDUCE	2.1
5% BASE LOAD - COULD REDUCE	1.8
NO REDUCTION OF BASE LOADS POSSIBLE	1.5

4.9 HVAC HEAT RECOVERY:

RANGE	WF
100% O.A., RECOVERY FEASIBLE	4.5
75% O.A., RECOVERY FEASIBLE	4.0
50% O.A., RECOVERY FEASIBLE	3.5
100% O.A., RECOVERY DIFFICULT	3.0
HEAT RECOVERY NOT FEASIBLE	2.5

4.10 USER RETROFIT TOLERANCE:

RANGE	WF
USER CAN TOLERATE MAJOR RETROFIT	4.5
USER CAN TOLERATE MINOR RETORFIT	3.5
USER CANNOT TOLERATE ANY DISRUPTIONS	2.5

ENERGY SAVING POTENTIAL TABULATION (uuu)

ITEM	WF
1.0 ANNUAL ENERGY USE	
2.0 RATIO UTILIZ. HRS. TO OPER. HRS.	
3.0 RATED CAP. OF HVAC EQUIP.	
4.1 BUILDING AGE & LIFE EXPECT.	
4.2 PERCENT GLASS & INFILTRATION	
4.3 LIGHTING LEVELS	
4.4 HVAC SYSTEM TYPE	
4.5 OUTSIDE AIR RATIO	
4.6 FAN ENERGY	
4.7 HVAC CONTROL SYSTEM	
4.8 BUILDING BASE LOAD	
4.9 HVAC HEAT RECOVERY	
4.10 USER RETROFIT TOLERANCE	
TOTAL	

FORM PEA-6 4-79 Revised 5/1/79

Please return to Governor's Office of Energy Resources, 7703 N. Lamar, #502, Austin, Texas 78752.

E N E R G Y A U D I T

Energy Auditor Certification: I hereby certify that I, _____(name of auditor), have participated fully in the Energy Auditor Training Program developed by the Governor's Office of Energy Resources conducted at _____(address of training site) by _____ (Sponsoring Agency-instructor) on _____(date), or in lieu of attending the training session, have completed _____(# of classroom hrs) hours of educational courses and/or on-the-job experience in analyzing and/or operating the mechanical and electrical and other energy using systems of the type of building or complex being audited. I have attached a copy of official educational transcripts and/or resumes of previous applicable work experience including the address and telephone numbers of such employers if I have claimed past education and/or work experience in lieu of attending the official training program. I further certify that I am not responsible for the day-to-day operations of the building and that a full disclosure of any financial interest which I might have relating to this energy audit or any energy conservation measure is attached hereto. I also certify that the energy audit was conducted in accordance with the requirements set forth under 10 CFR Part 450, paragraph 450.43 of the regulation which was published in the Federal Register dated April 2, 1979.

_____ Signature of Energy Auditor | _____ Social Security No. of Energy Auditor | _____ Organization of Auditor | (a) _____ Date

(b) _____ BUILDING OR COMPLEX NAME & ID NUMBER | # OF BLDGS

(c) _____ BUILDING SIZE (GROSS SQ.FT.)

(b1) _____ COMPONENT INSTITUTION NAME & I.D. NUMBER

FOLLOWING PEA FORMS COMPLETED ATTACHED HERETO:

(d) _____ PEA-1, (d1) _____ PEA-2, (e) _____ PEA-3, (e1) _____ PEA-4, (f) _____ PEA-5, (f1) _____ PEA-6

NAME AND ADDRESS OF OWNER

THE CONTENT OF THIS AUDIT FORM IS DESIGNED TO MEET THE REQUIREMENTS OF FEDERAL REGISTER, APRIL 2, 1979. VOL. 44, No. 64, PARA. 450.43

I D E S C R I P T I V E B U I L D I N G D A T A

1.0 LIST MAJOR CHANGES IN "FUNCTIONAL USE" OR "MODE OF OPERATION" PLANNED FOR NEXT 15 YEARS:

(g) _____

2.0 FOR BUILDINGS OVER 200,000 GROSS SQUARE FEET AREA, PROVIDE THE FOLLOWING FROM AVAILABLE DATA (AD) OR BY REASONABLE ESTIMATE (BE) IDENTIFY SOURCE IN ALL BLANKS.

2.1 PEAK ELECTRICAL DEMAND IN KW: (h) _____

MONTHS (h1) _____, _____, _____, DAY (j) _____, _____, _____,

HOUR OF DAY (k) _____, _____, _____.

2.2 PROVIDE BELOW THE ANNUAL ENERGY USE OF THE MAJOR BUILDING SYSTEM BY FUEL TYPE:

3.0 GENERAL BUILDING & SYSTEMS CONDITION:

(y) _____

MAJOR SYSTEM (l)	ELECTRICITY KWH (m)	ELECTRICITY BTU (n)	NATURAL GAS MCF (o)	NATURAL GAS BTU (p)	#2 OIL GAL (r)	#2 OIL BTU (s)	CENTRAL PLANT THERMAL STEAM-HOT WATER (t) BTU	CENTRAL PLANT THERMAL CHILLED WATER TON HRS. (u)	CENTRAL PLANT THERMAL CHILLED WATER BTU (v)	TOTAL BTU (w)

BTU CONVERSION FACTORS (x) (You may round to nearest million.)

ELEC.	KWH	X 11,600	= _____ BTU	STEAM/HW	MMBTU x 1,000,000	= _____	BTU
NAT.GAS.	MCF	X 1,030,000	= _____ BTU	STEAM	LBS x 1,390	= _____	BTU
OIL #2	GAL	X 138,690	= _____ BTU	CH.WATER	TON HR x 12,000	= _____	BTU
OIL #6	GAL	X 149,690	= _____ BTU	OTHER _____	x _____	= _____	BTU
				OTHER _____	x _____	= _____	BTU

FORM EA-1 4/79 Revised 4/23/79 Revised 5/1/79

E N E R G Y A U D I T

(b) _____ BUILDING NAME OR COMPLEX & ID NUMBER

(c) _____ BUILDING SIZE (GROSS SQ. FT.)

(b1) _____ COMPONENT INSTITUTION NAME & I.D. NUMBER

FORM EA-2 4-79 REVISED 4-23-79

I D E S C R I P T I V E B U I L D I N G D A T A (CONTINUED)

4.0 CLIMATIC FACTORS:

4.1 AVERAGE ANNUAL HEATING DEGREE DAYS _____ 4.2 AVERAGE ANNUAL COOLING DEGREE DAYS _____

4.3 AVERAGE MONTHLY SOLAR INSOLATION, HORIZONTAL SURFACES IN BTU/SQ.FOOT AND WIND VELOCITY IN MPH

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SOLAR (A)												
WIND VEL.(B)												

5.0 ROOF CHARACTERISTICS:

5.1 PRIMARY STRUCTURAL COMPONENT: ____STEEL, ____WOOD, ____REINF. CONC., ____OTHER, SPECIFY _____

5.2 ROOF SURFACE: ____BUILT UP, ____SLATE, ____TILE, ____WOOD SHINGLES, ____COMP. SHINGLES, ____OTHER _____

II E N E R G Y C O N S E R V A T I O N M A I N T E N A N C E & O P E R A T I O N P R O C E D U R E S

1.0 COMPLETE FOLLOWING TABLE USING ANNUAL TOTALS FOR FISCAL YEARS ENTERED, CONVERSION FACTORS LISTED ON FORM EA-1, & TOTALS OF BTU CONSUMPTION PER YEAR.

FISCAL YEAR (z)	ELECTRICITY (aa)		NATURAL GAS (bb)		#2 OIL (cc)		CENTRAL PLANT THERMAL (dd)			(ee)	TOTAL BTU/GROSS SQ. FT.
	KWH	BTU	MCF	BTU	GAL	BTU	STEAM-HOT WATER MMBTU/BTU	CHILLED WATER TON HRS.	BTU	(ff)	TOTAL BTU
BASE YEAR		X X X		X X X		X X X	X X X X X		X X X	(ee)	
	X X X		X X X		X X X		BTU	X X X		(ff)	
COMPARISON YR.		X X X		X X X		X X X	X X X X X		X X X	(ee)	
	X X X		X X X		X X X		BTU	X X X		(ff)	
LAST FULL YR		X X X		X X X		X X X	X X X X X		X X X	(ee)	
	X X X		X X X		X X X		BTU	X X X		(ff)	

2.0 LIST OF MAINTENANCE PROCEDURES AND OPERATING PROCEDURES WHICH HAVE BEEN IMPLEMENTED OVER ABOVE TIME SPAN OF YEARS TO REDUCE ENERGY CONSUMPTION.

(gg) _____ _____

_____ _____

_____ _____

(BASE YEAR: BTU/SQ. FT.) (hh) _____ − (LESSER COMPARISON YEAR: BTU/SQ. FT.) (JJ) _____ = (kk) _____ BTU/SQ. FT. REDUCTION

(kk) _____ BTU/SQ. FT. REDUCTION ÷ (hh) _____ BASE YEAR: BTU/SQ.FT. = (11) _____ % REDUCTION FROM BASE YEAR

ENERGY AUDIT

(b) _____ BUILDING OR COMPLEX NAME & ID NUMBER

(c) _____ BUILDING SIZE (GROSS SQ. FT.)

(b1) _____ COMPONENT INSTITUTION NAME & I.D. NUMBER

III RECOMMENDED ENERGY CONSERVATION MAINTENANCE & OPERATION PROCEDURES

PROVIDE FOLLOWING RECOMMENDATIONS BASED ON AN ON-SITE INSPECTION OF BUILDING:

1. SCHEDULED PREVENTIVE MAINTENANCE PLAN. RECOMMEND (mm) _____ YES _____ NO; IN EXISTENCE (nn) _____ YES _____ NO

2. PROVIDE A GENERAL ESTIMATE, EXPRESSED AS A RANGE, OF ANNUAL ENERGY SAVINGS & ANNUAL ENERGY COST SAVINGS WHICH COULD RESULT FROM IMPLEMENTING THE FOLLOWING MAINTENANCE & OPERATING PROCEDURES.

SYSTEM CHANGES	VALUES	% ENERGY	% COST
VENTILATION SYSTEM OPERATION	% SUB-TOTAL	(oo)	(pp)
REDUCED VENTILATION	2.0		
VARIABLE VENTILATION	1.0		
UNOCCUPIED AREA VENTILATION SHUT DOWN	0.5		
REPAIR OF CAULKING & WEATHER STRIPPING	0.5		
MAINTENANCE & REPAIR OF OPERATING CONTROLS	1.0		
HEATING & COOLING SYSTEM OPERATION	SUB-TOTAL	(rr)	(ss)
CHANGE IN THERMOSTAT CONTROL SET POINTS	2.0		
PROVIDE LOCKING THERMOSTAT COVERS	1.0		
RESET OF AIR & WATER TEMPERATURES	2.0		
UNOCCUPIED RESET OR SHUT DOWN OF SYSTEM	2.0		
SHUT DOWN NON-CRITICAL EXHAUST SYSTEMS	1.0		
LIGHTING SYSTEMS OPERATING	SUB-TOTAL	(tt)	(uu)
REDUCE ILLUMINATION LEVELS	3.0		
MAXIMIZE USE OF DAYLIGHT	1.0		
INSTALL HIGH EFFICIENCY LAMPS	1.0		
REDUCE OR DELETE EVENING CLEANING HOURS	2.0		

SYSTEM CHANGES	VALUES	% ENERGY	% COST
WATER SYSTEMS OPERATIONS	% SUB-TOTAL	(vv)	(ww)
REPAIR ALL LEAKS	0.5		
REDUCTION OF WATER CONSUMPTION (FLOW RESTRICTION)	0.5		
REDUCE HOT WATER TEMPERATURE	1.0		
INCREASE CHILLED WATER TEMPERATURE	1.0		
UTILITY PLANT & DISTRIBUTION SYSTEM OPERATION	SUB-TOTAL	(xx)	(yy)
EQUIPMENT CLEANING	0.5		
ADJUSTMENT OF AIR/FUEL RATIO	0.5		
COMBUSTION MONITORING & CONTROL	0.5		
ADJUSTMENT OF DRIVES, FANS, MOTORS, ETC.	1.0		
STEAM TRAP MAINTENANCE	1.5		
PIPE INSULATION REPAIR	1.0		
OTHER MAINTENANCE & OPERATION PROCEDURES	SUB-TOTAL	(zz)	(aaa)
_____			
_____			
_____			
_____			
_____	TOTALS		

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ENERGY AUDIT

(b) _____ BUILDING OR COMPLEX NAME & ID NUMBER

(c) _____ BUILDING SIZE (GROSS SQ. FT.)

(b1) _____ COMPONENT INSTITUTION NAME & I.D. NUMBER

IV ENERGY CONSERVATION RETROFIT RECOMMENDATIONS

1.0 BASIC BUILDING DATA: 1.1 ANNUAL ENERGY USE (bbb) _____ BTU/GROSS SQ. FT. PER YEAR

1.2 ANNUAL ENERGY COST (ccc) _____ $/GROSS SQ. FT. PER YEAR

1.3 DESCRIBE PHYSICAL CONDITION OF BUILDING ENVELOPE: (ddd) _____

_____

1.4 DESCRIBE PHYSICAL CONDITION OF BUILDING ENERGY USING SYSTEMS: (eee) _____

_____

2.0 BASED ON 1.1, 1.2, 1.3, AND/OR 1.4 ABOVE INDICATE THE NEED & POTENTIAL FOR ENERGY CONSERVATION RETROFIT IMPLEMENTATION. BRIEFLY OUTLINE RECOMMENDED RETROFIT OPTIONS:

(fff) _____

_____

3.0 BASED ON DATA NOTED IN SECTION VI, FORM PEA-4 & ITEMS 4.0 & 5.0, FORM EA-2 THE AUDITOR SHALL INDICATE WHETHER OR NOT THE BUILDING CONDITIONS AND/OR SITE CHARACTERISTICS PRESENT AN OPPORTUNITY TO APPLY SOLAR HEATING AND/OR COOLING SYSTEMS, OR SOLAR DOMESTIC HOT WATER HEATING SYSTEMS. ___YES, ___NO

V ENERGY CONSERVATION RETROFIT ASSESSMENT

1.0 DESCRIBE PROPOSED ENERGY CONSERVATION PROCEDURE (ECP): (ggg) _____

_____

_____

2.0 ESTIMATE OF INSTALLED COST OF ABOVE ECP: (hhh) $ _____

3.0 ESTIMATE OF ANNUAL ENERGY COST SAVINGS FOR ABOVE ECP: (iii) $ _____

4.0 PROJECTED SIMPLE PAYBACK PERIOD FOR ABOVE ECP IN YEARS:

ITEM 2.0 $ _____ (hhh) ÷ ITEM 3.0 $ _____ (iii) = _____ (jjj) YEARS

THE IMPLEMENTATION OF ENERGY CONSERVATION MAINTENANCE AND OPERATING PROCEDURES ARE A PREREQUISITE CONDITION FOR ELIGIBILITY FOR RECEIVING FEDERAL ASSISTANCE UNDER THE TECHNICAL ASSISTANCE PROGRAM AS DESCRIBED IN 10 CRF PART 455, D.O.E. RULES & REGULATIONS.

FORM EA-4 4-79 REVISED 4-23-79

TA/ECP APPLICATION FORMS

This section contains the application forms which must be completed and submitted to the State if Federal matching funds are to be obtained.

LIAM P. CLEMENTS, JR.
GOVERNOR

OFFICE OF THE GOVERNOR
STATE CAPITOL
AUSTIN, TEXAS 78711

July 9, 1979

MEMORANDUM

TO: Energy Managers of Schools

FROM: Duane Keeran, Program Coordinator for Educational Institutio

SUBJECT: Content of Technical Assistance Reports

Although you have already been informed about the content of the tech assistance report as identified in the federal regulations, 10 CFR 45 the State Plan includes a few additional requirements. Because there little time remaining before the first deadline (July 27) for submiss energy conservation measures applications, you will not be required t the additional information required by the State for the July 27th de except the information that was also described in 10 CFR 455.42 and t memorandum of June 15, 1979 from David Marks entitled, "Grants Progra Technical Assistance and Energy Conservation Measures."

However, if the July 27th deadline is extended to November 1, 1979 as vided in the June 15th memorandum, the additional state requirements in the attached technical assistance report outline will be required vided in a standard technical assistance report format to be develope Governor's Office of Energy Resources. This format will be required reports submitted after September 30, 1979.

The technical assistance reports submitted prior to September 30, 19 follow the outline with subject titles and outline reference letters numbers the same as indicated in the outline.

If you need additional information, you may contact me at (512) 475-

Sincerely,

Duane Keeran

Duane Keeran
Progam Coordinator f
Educational Institut

REGION VIII E S C
RECEIVED
JUL 16 1979
EXECUTIVE DIRECTOR

DK:ga

SECTION 15. TECHNICAL ASSISTANCE ANALYSIS MUST CONFORM TO REQ (10 CFR 455.90,n)

The State is required to establish procedures for determining that technical assistance programs, performed without the use of federal funds, have been performed in compliance with the requirements of 10 CFR 455.42 for the purposes of satisfying the eligibility requirements contained in 10 CFR 455.51 (a)(3). 10 CFR 455.51 (a)(3) states that an applicant must:

> (a)(3) Have completed a technical assistance program or its equivalent, as determined by the State in accordance with the State Plan, for the building for which financial assistance is to be requested subsequent to the most recent construction, reconfiguration or utilization change to the building which significantly modified energy use within the building.

As the date of the most recent addition or major modification affecting energy use will be reported on the preliminary energy audit report, page 1, for that building, and since the technical assistance report will be dated, the requirement that the technical assistance be conducted after such a modification can easily be monitored and enforced by the State.

All technical assistance detailed engineering analysis reports are required to provide the minimal information described in 10 CFR 455.42 regardless of whether or not the technical assistance was conducted with federal funding or whether the detailed engineering analysis was conducted prior to or after November 9, 1978, the date of enactment of the federal legislation for the grants program. However, if a technical assistance report was written prior to the date of this Plan, the analyst would only be required to briefly provide the information in the format provided in 10 CFR 455.42 with references to the pages in the original report where the more detailed analysis is written. Any omission of the requirements of 10 CFR 455.42 in the original report necessitates such an analysis. The summary report must be attached to a copy of the original report to be submitted with the ECM application.

Thus, the procedure that the State will use to ensure that technical assistance analyses conducted without the use of federal funds meet the requirements of 10 CFR 455.42 is to require that all technical assistance analysts submit final reports in accordance with 10 CFR 455.42 as described in Sections 15.1 and 15.2 below.

The content and quality of the technical assistance reports will also be assessed by a technical review committee composed of experts in energy systems. This committee will be responsible for determining the extent to which the technical assistance reports conform to the requirements of 10 CFR 455.42.

Section 15.1 Technical Assistance Report Format

The Governor's Office of Energy Resources will provide the institutions wit a detailed format for the technical assistance report in the Appendix of th approved State Plan or shortly after the date of publication of the approved Stat Plan. The format will be required for all technical assistance reports submitte with ECM applications after September 30, 1979 as well as those TA reports fc local governments and public care institutions funded by federal grants.

Until the Governor's Office of Energy Resources publishes a required forma for the technical assistance report, technical assistance reports should follow th outline described in Section 15.2 below with section titles stated in accordance wit the outline in order that the format of all reports may be consistent. The sub-part under part F in Section 15.2 below should be provided as a whole for each energ conservation measure rather than reporting each measure for each sub-part.

The Governor's Office of Energy Resources added some content requirement to the technical assistance report (See Section 15.2 F. 6. a., F. 6. d., F. 8 and F. 9.)

Section 15.2 Contents of Technical Assistance Report

It is highly recommended that the technical assistance analyst develo alternative groupings of energy conservation measures with the required analyse for energy savings, energy cost savings, and simple payback period, among other for each building. Alternative groupings of energy conservation measures wil enable the building owner to best assess the opportunities for grant approval i view of the goals and matching funds of the institution. After assessing the variou alternatives, the building owner will be able to present the best alternativ grouping of energy conservation measures in the ECM application.

The technical assistance detailed engineering analysis report shall include th following requirements of 10 CFR 455.42 and the addtional state requirements:

A. Identification of each maintenance and operating procedure which may affec a reduction in energy consumption.

B. A description of building characteristics and energy data including -

1. The results of the preliminary energy audit and energy audit of the building.
2. The operating characteristics of energy using systems, and
3. The estimated remaining useful life of the building.

C. An analysis of the estimated energy consumption of the building, by fuel type (in total Btu's and Btu/Sq.Ft./Yr), at optimum efficiency (assuming implementation of all energy conservation maintenance and operating procedures).

D. An evaluation of the building's potential for solar conversion, particularly for water heating systems.

E. A listing of any known local zoning ordinances and building codes which may restrict the installation of solar systems.

F. A description and analysis of all recommendations, if any, for acquisition and installation of energy conservation measures, including solar and other renewable resource measures, setting forth

1. A description of each recommended energy conservation measure,
2. An estimate of the cost of design, acquisition and installation of each energy conservation measure,
3. An estimate of the useful life of each energy conservation measure,
4. An estimate of increases or decreases in maintenance and operating costs that would result from each energy conservation measure, if any,
5. An estimate of the salvage value or disposal cost of each energy conservation measure at the end of its useful life, if any, and
6. An estimate of the annual energy and energy cost savings (using current energy prices) expected from the acquisition and installation of each energy conservation measure. In calculating the potential energy cost savings of each recommended energy conservation measure, including solar or other renewable resource measure, the technical assistance analysts shall

a. Assume that all energy savings obtained from energy conservation maintenance and operating procedures have been realized (Note: renovating a building for a change in functional use will not be considered as a measure to save energy);

b. Calculate the total energy and energy cost savings, by fuel type, expected to result from the acquisition and installation of all recommended energy conservation measures, taking into account the interaction among the various measures;

c. Calculate that portion of the total energy and energy cost savings, as determined in (b.) above, attributable to each individual energy conservation measure;

d. (Additional State Requirement) Calculate the total energy savings, identified in (b.) above, based on the conversion factors required in 10 CFR 450.42 (a)(ii) and the State conversion factors in the energy audit form, page 1, developed by the Governor's Office of Energy Resources.

7. The simple payback period of each recommended energy conservation measure, taking into account the interactions among the various measures. The simple payback period is calculated by dividing the estimated total cost of the measure, as determined pursuant to Paragraph 455.42 (b)(5)(ii), by the estimated annual cost savings accruing from the measure, as determined pursuant to Paragraph 455.42 (b)(5)(vi).

For the purposes of ranking applications, the simple payback period shall be calculated using the cost savings resulting from energy savings only, determined on the basis of current energy prices. The estimated cost of the measure shall be the total cost for design and other professional services (excluding costs of a technical assistance program), if any, and acquisition and installation costs. Other economic analyses, such as life-cycle costing, which consider all costs and cost savings, such as maintenance costs and/or savings, resulting from an energy conservation measure, are recommended but not required, for use by the institution in its decision-making process*;

8. (Additional State Requirement) A statement of whether or not the calculations for energy savings, energy cost savings, and the simple payback period of the measure are dependent upon the implementation of the other measures proposed for the building. Also, a statement of whether or not the feasibility of the measure is physically dependent

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*Life cycle costing procedures may be provided and required by the U.S. Department of Energy subsequent to the first grant program cycle.

upon the other measures. If the measure is dependent on the other measures, identify the measure or the measures upon which it is dependent; and describe how the measure is dependent.

8. (Additional State Requirement) Identify and describe the procedures used in calculating energy savings and energy cost savings of the measure. Examples of such procedures may include the DOE-2 computer program, Blast computer program and ASHRAE manuals. The building owner must submit a copy of the energy savings calculations or computer printout with the ECM application. The building owner should also submit (if available) a current price list of the cost of the equipment and materials related to each measure obtained from the distributor or retailer to support the amount claimed. Such documentation will contribute toward a favorable technical review rating for the application as described in Section 6.2.1.

G. A listing of energy use and cost data for each fuel type used for the prior 12-month period.

H. A signed and dated certification that the technical assistance program has been conducted in accordance with the requirements of this section and the grant application and that the data presented is accurate to the best of the technical assistance analyst's knowledge.

SECTION 16.0 STATE ADMINISTRATION OF THE PROGRAM (10 CFR 455.90, o)

In accordance with 10 CFR 455.90 (o), the State is required to establish:

(o) The procedures for State management, financial audit, monitoring and evaluation of technical assistance programs and energy conservation measures receiving financial assistance under this part;

EIA-145

U.S. DEPARTMENT OF ENERGY
Energy Information Administration
Washington, D.C. 20461

FORM APPROVED
OMB NO. 038-R0402

GRANTS PROGRAMS FOR SCHOOLS AND HOSPITALS AND BUILDINGS OWNED BY UNITS OF LOCAL GOVERNMENT AND PUBLIC CARE INSTITUTIONS APPLICATION

GENERAL INFORMATION

I. Regulations/Purpose

Under the National Energy Conservation Policy Act (P.L. 95-619, 92 Stat. 3206), schools, hospitals, units of local government and public care institutions are eligible for grants of Federal funds which are to be used to aid in the conduct of technical assistance programs in public and non-profit schools and hospitals, or of local government and public care buildings. Schools and hospitals are also eligible for grants to aid in the acquisition and installation of energy conservation measures. The Department of Energy (DOE) Regulations published in the Federal Register on April 17, _____, 1979, page22940, et. seq, provide implementing guidelines for technical assistance and energy conservation measures under the NECPA. A copy of the regulations may be obtained from U.S. Department of Energy, Distribution - Room B-447, Federal Building, 12th & Pennsylvania Avenue, N.W., Washington, D.C. 20461.

No application will be eligible for a grant unless its application clearly demonstrates that the proposed programs for technical assistance or energy conservation measures either meet, or prior to the expenditure of any DOE grant funds, will meet, all of the minimum program requirements contained in the Regulations.

II. Completion of Application

The Office of Management and Budget's (OMB) Standard Form 424 (Federal Assistance), prescribed by OMB Circular A-102 dated September 12, 1977, will hereinafter be referred to;

—Grants Programs for Schools and Hospitals and Buildings Owned by Units of Local Government and Public Care Institutions Application (Form EIA-145)

OMB Standard Form-424 has been modified to require applicants on Form EIA-145, under the remarks section, to provide specific details of program operation in addition to specific assurances required by the NECPA and those incorporated in the Federal Register, Vol. 42, Sept. 12, 1977.

GENERAL INFORMATION Con't.

In completing the application package, applicants should refer to Office of Management and Budget (OMB) Circulars A-102 and Treasury Circular 1082, both of which deal with grants and financial management.

Sums allocated for each State for the purposes of technical assistance and energy conservation measures will be a portion of the amount appropriated by the Congress for this purpose. The allocation formula is set forth in 10CFR 455.101 of the Regulations.

Applications that contain errors or other defects may be returned to the applicant for correction of such errors or defects.

III. When and Where to Submit Application

In order to obtain grant funds for technical assistance or energy conservation measures, applicants must submit an application in conformance with the requirements of the DOE Regulations, as set forth in 10CFR 455.60 and 10CFR 455.61 to the appropriate State energy office not later than the date specified in the approved State Plan, unless an extension of time is requested and granted. One original copy is to be submitted to the appropriate State Energy Office. State applications for administrative costs will be submitted in accordance with 10CFR 455.62.

GENERAL INSTRUCTIONS

Applications should be submitted in accordance with the applicable approved State Plan. The application contains 5 parts, each of which must be completed by the applicant. Part I requires general information about the applicant and the nature of the grant; Part II requires information necessary to assure conformance with OMB regulations; Part III requires detailed budget information; Part IV requires a detailed description, of the manner in which the applicant will conduct the technical assistance program or energy conservation measures project; and Part V contains the assurances required of an applicant by Federal law and regulations pursuant to Federal law as a condition of eligibility for Federal financial assistance.

Programs for technical assistance and energy conservation measures for schools are to be coordinated with the State school facilities agency while those for hospitals are to be coordinated with the State hospital facilities agency. (10 CFR 455.70)

EIA-145

FORM APPROVED
OMB NO. 038-R0402

PART I: GENERAL INFORMATION

SPECIFIC INSTRUCTIONS

Part I of the application is the standard form used for most State grant programs. Where possible, DOE has preprinted information of the form. The cover sheet should be completed as accurately as possible by the applicant. Under remarks, the applicant must provide the additional information required under the program.

APPLICANT PROCEDURES FOR SECTION I

Applicant will complete all items in Section I. If an item is not applicable, write "NA". If additional space is needed, insert an astensk "*", and use the remarks section on the back of the form. An explanation follows for each item:

Item

1. Mark appropriate box. Pre-application and application guidance is in FMC 74-4 and Federal agency program instructions. Notification of intent guidance is in Circular A-95 and procedures from clearinghouse. Applicant will not use "Report of Federal Action" box.

2a Applicant's own control number, if desired.

2b. Date Section I is prepared.

3a. Number assigned by State clearinghouse, or if delegated by State, by areawide clearinghouse. All requests to Federal agencies *must* contain this identifier if the program is covered by Circular A-95 and required by applicable State/areawide clearinghouse procedures. If in doubt, consult your clearinghouse.

3b. Date applicant notified of clearinghouse identifier.

4a-4h. Legal name of applicant/recipient, name of primary organizational unit which will undertake the assistance activity, complete address of applicant, and name and telephone number of person who can provide further information about this request.

5. Employer identification number of applicant as assigned by Internal Revenue Service.

6a. Use Catalog of Federal Domestic Assistance number assigned to program under which assistance is requested. If more than one program (e.g., joint-funding) write "multiple" and explain in remarks. If unknown, cite Public Law or U.S. Code.

6b. Program title from Federal Catalog. Abbreviate if necessary.

7. Bnef title and appropnate description of project. For notification of intent, continue in remarks section if necessary to convey proper description.

8. Mostly self-explanatory. "City" includes town, township or other municipality.

9. Check the type(s) of assistance requested. The definitons of the terms are.

   A. Basic Grant. An onginal request for Federal funds. This would not include any coniribution provided under a supplemental grant.

   B. Supplemental Grant. A request to increase a basic grant in certain cases where the eligible applicant cannot supply the required matching share of the basic Federal program (e.g., grants awarded by the Appalachian Regional Commission to provide the applicant a matching share).

   C. Loan. Self explanatory.

   D. Insurance. Self explanatory.

   E. Other. Explain on remarks page.

Item

10. Governmental unit where significant and meaningful impact could be observed. List only largest unit or units affected, such as State, county, or city. If entire unit affected, list it rather than subunits.

11. Estimated number of persons directly benefiting from project.

12. Use appropriate code letter. Definitions are:

   A. New. A submittal for the first time for a new project.

   B. Renewal. An extension for an additional funding/budget period for a project having no projected completion date, but for which Federal support must be renewed each year.

   C. Revision. A modification to project nature or scope which may result in funding change (increase or decrease).

   D. Continuation. An extension for an additional funding/budget period for a project the agency initially agreed to fund for a definite number of years.

   E. Augmentation. A requirement for additional funds for a project previously awarded funds in the same funding/budget period. Project nature and scope unchanged.

13. Amount requested or to be contributed during the first funding/budget period by each contributor. Value of in-kind contributions will be included. If the action is a change in dollar amount of an existing grant (a revision or augmentation), indicate only the amount of the change. For decreases enclose the amount in parentheses. If both basic and supplemental amounts are included, break out in remarks. For multiple program funding, use totals and show program breakouts in remarks. Item definitions: 13a, amount requested from Federal Government; 13b, amount applicant will contribute. 13c, amount from State, if applicant is not a State; 13d, amount from local government, if applicant is not a local government; 13e, amount from any other sources, explain in remarks.

14a. Self explanatory.

14b. The district(s) where most of actual work will be accomplished. If city-wide or State-wide, covering several districts, write "city-wide" or "State-wide."

15. Complete only for revisions (item 12c), or augmentations (item 12e).

16. Approximate date project expected to begin (usually associated with estimated date of availability of funding).

17. Estimated number of months to complete project after Federal funds are available.

18. Estimated date pre-application/application will be submitted to Federal agency if this project requires clearinghouse review. If review not required, this date would usually be same as date in item 2b.

PART I: GENERAL INFORMATION Con't.

Item	
19	Existing Federal identification number if this is not a new request and directly relates to a previous Federal action. Otherwise write "NA".
20.	Indicate Federal agency to which this request is addressed. Street address not required, but do use ZIP.
21.	Check appropriate box as to whether Section IV of form contains remarks and/or additional remarks are attached

APPLICANT PROCEDURES FOR SECTION II

Applicants will always complete items 23a, 23b, and 23c. If clearinghouse review is required, item 22b must be fully completed. An explanation follows for each item.

Item	
22b	List clearinghouses to which submitted and show in appropriate blocks the status of their responses. For more than three clearinghouses, continue in remarks section. All written comments submitted by or through clearinghouses must be attached.
23a	Name and title of authorized representative of legal applicant
23b.	Self explanatory.
23c.	Self explanatory.
Note:	Applicant completes only Sections I and II. Section III is completed by Federal agencies.

FEDERAL AGENCY PROCEDURES FOR SECTION III

If applicant-supplied information in Sections I and II needs no updating or adjustment to fit the final Federal action, the Federal agency will complete Section III only. An explanation for each item follows:

Item	
24.	Executive department or independent agency having program administration responsibility.
25.	Self explanatory.
26.	Primary organizational unit below department level having direct program management responsibility.
27.	Office directly monitoring the program.
28.	Use to identify non-award actions where Federal grant identifier in item 30 is not applicable or will not suffice.
29.	Complete address of administering office shown in item 26.
30.	Use to identify award actions where different from Federal application identifier in item 28.
31.	Self explanatory. Use remarks section to amplify where appropriate.
32.	Amount to be contributed during the first funding/budget period by each contributor. Value of in-kind contributions will be included. If the action is a change in dollar amount of an existing grant (a revision or augmentation), indicate only the amount of change. For decreases, enclose the amount in parentheses. If both basic and supplemental amounts are included, break out in remarks. For multiple program funding, use totals and show program breakouts in remarks. Item definitions: 32a, amount awarded by Federal Government. 32b, amount applicant will contribute. 32c, amount from State, if applicant is not a State. 32d, amount from local government if applicant is not a local government. 32e, amount from any other sources, explain in remarks.
33.	Date action was taken on the request.
34.	Date funds will become available.
35.	Name and telephone no. of agency person who can provide more information regarding this assistance.
36.	Date after which funds will no longer be available.
37.	Check appropriate box as to whether Section IV of form contains Federal remarks and/or attachment of additional remarks.
38.	For use with A-95 action notices only. Name and telephone of person who can assure that appropriate A-95 action has been taken—if same as person shown in item 35, write "same". If not applicable, write "NA".

Federal Agency Procedures—special considerations

A. *Treasury Circular 1082 compliance.* Federal agency will assure proper completion of Sections I and III. If Section I is being completed by Federal agency, all applicable items must be filled in. Addresses of State Information Reception Agencies (SCIRA's) are provided by Treasury Department to each agency. This form replaces SF 240, which will no longer be used.

B. *OMB Circular A-95 compliance.* Federal agency will assure proper completion of Sections I, II, and III. This form is required for notifying all reviewing clearinghouses of major actions on all programs reviewed under A-95. Addresses of State and areawide clearinghouses are provided by OMB to each agency. Substantive differences between applicant's request and/or clearinghouse recommendations, and the project as finally awarded will be explained in A-95 notifications to clearinghouses.

C. *Special note.* In most, but not all States, the A-95 State clearinghouse and the (TC 1082) SCIRA are the same office. In such cases, the A-95 award notice to the State clearinghouse will fulfill the TC 1082 award notice requirement to the State SCIRA. Duplicate notification should be avoided.

PART II: PROJECT APPROVAL INFORMATION

SPECIFIC INSTRUCTIONS

These items must be answered as accurately as possible; if additional information is needed to justify an item, a continuation sheet should be used. DOE has checked "yes" or "no" on questions where the answer is known.

Negative answers will not require an explanation unless the Federal agency requests more information at a later date. Provide supplementary data for all "Yes" answers in the space provided in accordance with the following instructions:

Item 1 – Provide the name of the governing body establishing the priority system and the priority rating assigned to this project.

Item 2 – Provide the name of the agency or board which issued the clearance and attach the documentation of status or approval.

Item 3 – Attach the clearinghouse comments for the application in accordance with the instructions contained in Office of Management and Budget Circular No. A-95. If comments were submitted previously with a preapplication, do not submit them again but any additional comments received from the clearinghouse should be submitted with this application.

Item 4 – Furnish the name of the approving agency and the approval date.

Item 5 – Show whether the approved comprehensive plan is State, local or regional, or if none of these, explain the scope of the plan. Give the location where the approved plan is available for examination and state whether this project is in conformance with the plan.

Item 6 – Show the population residing or working on the Federal installation who will benefit from this project.

Item 7 – Show the percentage of the project work that will be conducted on federally-owned or leased land. Give the name of the Federal installation and its location.

Item 8 – Describe briefly the possible beneficial and harmful impact on the environment of the proposed project. If an adverse environmental impact is anticipated, explain what action will be taken to minimize the impact. Federal agencies will provide separate instructions if additional data is needed.

Item 9 – State the number of individuals, families, businesses, or farms this project will displace. Federal agencies will provide separate instructions if additional data is needed.

Item 10 – Show the Federal Domestic Assistance Catalog number, the program name, the type of assistance, the status and the amount of each project where there is related previous, pending or anticipated assistance. Use additional sheets, if needed.

PART III: BUDGET INFORMATION

SPECIFIC INSTRUCTIONS

As in all grants programs, a budget sheet listing anticipated expenditures by cost category must be prepared. The standard form has been modified to eliminate information not required or not relevant to this program.

For the purpose of this program, Federal and non-Federal funds are defined as follows: Federal funds are those appropriated specifically for the Schools and Hospitals under NECPA, Title III, Part I, or for the Local Government and Public Care Buildings under NECPA, Title III, Part 2, or any other funding provided by the Federal Government. Non-Federal funds are any State, local or other funds available for, and directly related to the project. Applicants should note the restrictions put on expenditures of their funds by the Regulations, and must keep in mind that no Federal funds available to them may be used to qualify as any part of the matching portion.

Funds shall not be used directly or indirectly:

(1) to purchase equipment, having a value in excess of $500 (Technical Assistance only);

(2) for the purchase of real property (see definition OMB A-102, Attachment N).

Also, see 10CFR 455.60 (d) and (e) and 10CFR 455.81, 10CFR 455.82 and 10CFR 455.83 for further restrictions on the use of grant funds.

PART III: BUDGET INFROMATION Con't.

General Information

This form is designed so that application can be made for funds from one or more grant programs. In preparing the budget, adhere to any existing Federal grantor agency guidelines which prescribe how and whether budgeted amounts should be separately shown for different functions or activities within the program. For some programs, grantor agencies may require budgets to be separately shown by function or activity. For other programs, grantor agencies may not require a breakdown by function or activity. Sections A, B, C, and D should include budget estimates for the whole project except when applying for assistance which requires Federal authorization in annual or other funding period increments. In the latter case, Sections A, B, C, and D should provide the budget for the first budget period (usually a year) and Section E should present the need for Federal assistance in the subsequent budget periods. All applications should contain a breakdown by the object class categories shown in Lines a-k of Section B.

Section A. Budget Summary
Lines 1-4, Columns (a) and (b).

For applications pertaining to a *single* Federal grant program (Federal Domestic Assistance Catalog number) and *not requiring* a functional or activity breakdown, enter on Line 1 under Column (a) the catalog program title and the catalog number in Column (b).

For applications pertaining to a *single* program *requiring* budget amounts by multiple functions or activities, enter the name of each activity or function on each line in Column (a), and enter the catalog number in Column (b). For applications pertaining to *multiple* programs where *none* of the programs *require* a breakdown by function or activity, enter the catalog program title on each line in Column (a) and the respective catalog number on each line in Column (b).

For applications pertaining to *multiple* programs where one or more programs *require* a breakdown by function or activity, prepare a separate sheet for each program requiring the breakdown. Additional sheets should be used when one form does not provide adequate space for all breakdown of data required. However, when more than one sheet is used, the first page should provide the summary totals by programs.

Lines 1-4, Columns (c) through (g).

For new applications, leave Columns (c) and (d) blank. For each line entry in Columns (a) and (b), enter in Columns (e), (f), and (g) the appropriate amounts of funds needed to support the project for the first funding period (usually a year).

For continuing grant program applications, submit these forms before the end of each funding period as required by the grantor agency. Enter in Columns (c) and (d) the estimated amounts of funds which will remain unobligated at the end of the grant funding period *only* if the Federal grantor agency instructions provide for this. Otherwise, leave these columns blank. Enter in columns (e) and (f) the amounts of funds needed for the upcoming period. The amount(s) in Column (g) should be the sum of amounts in Columns (e) and (f).

For supplemental grants and changes to existing grants, do not use Columns (c) and (d). Enter in Column (e) the amount of the increase or decrease of Federal funds and enter in Column (f) the amount of the increase or decrease of non-Federal funds. In Column (g) enter the new total budgeted amount (Federal and non-Federal) which includes the total previous authorized budgeted amounts plus or minus, as appropriate, the amounts shown in Columns (e) and (f). The amount(s) in Column (g) should *not* equal the sum of amounts in Columns (e) and (f).

Line 5 – Show the totals for all columns used.

Section B. Budget Categories

In the column headings (1) through (4), enter the titles of the same programs, functions, and activities shown on Lines 1-4, Column (a), Section A. When additional sheets were prepared for Section A, provide similar column headings on each sheet. For each program, function or activity, fill in the total requirements for funds (both Federal and non-Federal) by object class categories.

Lines 6a-h – Show the estimated amount for each direct cost budget (object class) category for each column with program, function or activity heading.

Line 6i – Show the totals of Lines 6a to 6h in each column.

Line 6j – Show the amount of indirect cost. Refer to FMC 74-4.

Line 6k – Enter the total of amounts on Lines 6i and 6j. For all applications for new grants and continuation grants the total amount in column (5), Line 6k, should be the same as the total amount shown in Section A, Column (g), Line 5. For supplemental grants and changes to grants, the total amount of the increase or decrease as shown in Columns (1)-(4), Line 6k should be the same as the sum of the amounts in Section A, Columns (e) and (f) on Line 5. When additional sheets were prepared, the last two sentences apply only to the first page with summary totals.

Line 7 – Enter the estimated amount of income, if any, expected to be generated from this project. Do not add or subtract this amount from the total project amount. Show under the program narrative statement the nature and source of income. The estimated amount of program income may be considered by the Federal grantor agency in determining the total amount of the grant.

PART III: BUDGET INFORMATION Con't.

Section C. Source of Non-Federal Resources

Line 8-11 – Enter amounts of non-Federal resources that will be used on the grant. If in-kind contributions are included, provide a brief explanation on a separate sheet. (See Attachment F, Circular A–102.)

Column (a) – Enter the program titles identical to Column (a), Section A. A breakdown by function or activity is not necessary.

Column (b) – Enter the amount of cash and in-kind contributions to be made by the applicant as shown in Section A. (See also Attachment F, Circular A–102.)

Column (c) – Enter the State contribution if the applicant is *not* a State or State agency. Applicants which are a State or State agencies should leave this column blank.

Column (d) – Enter the amount of cash and in-kind contributions to be made from all other sources.

Column (e) – Enter totals of Columns (b), (c), and (d).

Line 12 – Enter the total for each of Columns (b)-(e). The amount in Column (e) should be equal to the amount on Line 5, Column (f), Section A.

Section D. Forecasted Cash Needs

Line 13 – Enter the amount of cash needed by quarter from the grantor agency during the first year.

Line 14 – Enter the amount of cash from all other sources needed by quarter during the first year.

Line 15 – Enter the totals of amounts on Lines 13 and 14.

Section E. Budget Estimates of Federal Funds Needed for Balance of the Project

Lines 16-19 – Enter in Column (a) the same grant program titles shown in Column (a), Section A. A breakdown by function or activity is not necessary. For new applications and continuing grant applications, enter in the proper columns amounts of Federal funds which will be needed to complete the program or project over the succeeding funding periods (usually in years). This Section need not be completed for amendments, changes, or supplements to funds for the current year of existing grants.

If more than four lines are needed to list the program titles submit additional schedules as necessary.

Line 20 – Enter the total for each of the Columns (b)-(e). When additional schedules are prepared for this Section, annotate accordingly and show the overall totals on this line.

Section F – Other Budget Information.

Line 21 – Use this space to explain amounts for individual direct object cost categories that may appear to be out of the ordinary or to explain the details as required by the Federal grantor agency.

Line 22 – Enter the type of indirect rate (provisional, predetermined, final or fixed) that will be in effect during the funding period, the estimated amount of the base to which the rate is applied, and the total indirect expense.

Line 23 – Provide any other explanations required herein or any other comments deemed necessary.

PART IV: PROGRAM NARRATIVE

SPECIFIC INSTRUCTIONS

The applicant shall provide a narrative description of how it proposes to conduct the technical assistance or energy conservation measures program, making use of the program narrative instructions as outlined in OMB Circular A-102 and the additional guidelines given by DOE on the next page.

The required program narrative should be attached to this form.

PART IV: PROGRAM NARRATIVE Con't.

GUIDELINES

Grant applications for technical assistance must include the following:

(a) The name, address and telephone number of the applicant's representative responsible for administering the program;

(b) A description, by building, of the proposed technical assistance program, including a detailed schedule of program activities together with milestone dates;

(c) The energy audit report for the building.

Grant applications for energy conservation measures must include the following:

(a) The name, address and telephone number of the applicant's representative responsible for administering the program;

(b) A listing, by building, of the specific energy conservation measures proposed for funding, indicating the cost of each measure, the estimated energy savings of each measure, the projected simple payback period for each measure, and the average simple payback period of all measures proposed for the building;

(c) A detailed schedule, together with milestone dates, for completion of the acquisition and installation of energy conservation measures for each building;

(d) The technical assistance program report for the building;

(e) If the applicant is aware of any adverse environmental impact which may arise from the adoption of any energy conservation measure, the application shall include an analysis of that impact and the applicant's plan to minimize or avoid such impact.

PART IV: PROGRAM NARRATIVE Con't.

Prepare the program narrative statement in accordance with the following instructions for all new grant programs. Requests for continuation or refunding and changes on an approved project should respond to item 5b only. Requests for supplemental assistance should respond to question 5c only.

1. OBJECTIVES AND NEED FOR THIS ASSISTANCE.

Pinpoint any relevant physical, economic, social, financial, institutional, or other problems requiring a solution. Demonstrate the need for assistance and state the principal and subordinate objectives of the project. Supporting documentation or other testimonies from concerned interests other than the applicant may be used. Any relevant data based on planning studies should be included or footnoted.

2. RESULTS OR BENEFITS EXPECTED.

Identify results and benefits to be derived. For example, when applying for an award to establish a neighborhood health center provide a description of who will occupy the facility, how the facility will be used, and how the facility will benefit the general public.

3. APPROACH.

a. Outline a plan of action pertaining to the scope and detail of how the proposed work will be accomplished for assistance program, function or activity, provided in the budget. Cite factors which might accelerate or decelerate the work and your reason for taking this approach as opposed to others. Describe any unusual features of the project such as design or technological innovations, reductions in cost or time, or extraordinary social and community involvement.

b. Provide for each assistance program, function or activity, quantitative monthly or quarterly projections of the accomplishments to be achieved in such terms as the number of jobs created; the number of people served; and the number of patients treated. When accomplishments cannot be quantified by activity or function, list them in chronological order to show the schedule of accomplishments and their target dates.

c. Identify the kinds of data to be collected and maintained and discuss the criteria to be used to evaluate the results and successes of the project. Explain the methodology that will be used to determine if the needs identified and discussed are being met and if the results and benefits identified in item 2 are being achieved.

d. List organizations, cooperators, consultants, or other key individuals who will work on the project along with a short description of the nature of their effort or contribution.

4. GEOGRAPHIC LOCATION.

Give a precise location of the project or area to be served by the proposed project. Maps or other graphic aids may be attached.

5. IF APPLICABLE, PROVIDE THE FOLLOWING INFORMATION:

a. For research or demonstration assistance requests, present a biographical sketch of the program director with the following information: name, address, phone number, background, and other qualifying experience for the project. Also, list the name, training and background for other key personnel engaged in the project.

b. Discuss accomplishments to date and list in chronological order a schedule of accomplishments, progress or milestones anticipated with the new funding request. If there have been significant changes in the project objectives, location approach, or time delays, explain and justify. For other requests for changes or amendments, explain the reason for the change(s). If the scope or objectives have changed or an extension of time is necessary, explain the circumstances and justify. If the total budget has been exceeded, or if individual budget items have changed more than the prescribed limits contained in Attachment K to Circular A-102, explain and justify the need for additional funding.

c. For supplemental assistance requests, explain the reason for the request and justify the need for additional funding.

PART V: ASSURANCES

SPECIFIC INSTRUCTIONS

This part contains the certifications required of applicants for Federal grants. The applicant shall certify in its application for, and acceptance and use of Federal funds, that it will comply with the laws and regulations governing these grant programs.

The Assurances section applies to the original application and to any subsequent modification or amendments.

The Applicant hereby assures and certifies that he will comply with the regulations, policies, guidelines, and requirements, including OMB Circular No. A-102 and FMC 74-4, as they relate to the application, acceptance and use of Federal funds for this federally assisted project.† Also the Applicant assures and certifies with respect to the grant that:

1. It possesses legal authority to apply for the grant; that a resolution, motion or similar action has been duly adopted or passed as an official act of the applicant's governing body, authorizing the filing of the application, including all understandings and assurances contained therein, and directing and authorizing the person identified as the official representative of the applicant to act in connection with the application and to provide such additional information as may be required.
2. It will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352) and in accordance with Title VI of that Act, no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the applicant receives Federal financial assistance and will immediately take any measures necessary to effectuate this agreement.
3. It will comply with Title VI of the Civil Rights Act of 1964 (42 USC 2000d) prohibiting employment discrimination where (1) the primary purpose of a grant is to provide employment or (2) discriminatory employment practices will result in unequal treatment of persons who are or should be benefiting from the grant-aided activity.
4. It will comply with requirements of the provisions of the Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (P.L. 91-646) which provides for fair and equitable treatment of persons displaced as a result of Federal and federally assisted programs.
5. It will comply with the provisions of the Hatch Act which limit the political activity of employees.
6. It will comply with the minimum wage and maximum hours provisions of the Federal Fair Labor Standards Act, as they apply to hospital and educational institution employees of State and local governments.
7. It will establish safeguards to prohibit employees from using their positions for a purpose that is or gives the appearance of being motivated by a desire for private gain for themselves or others, particularly those with whom they have family, business, or other ties.
8. It will give the sponsoring agency or the Comptroller General through any authorized representative the access to and the right to examine all records, books, papers, or documents related to the grant.
9. It will comply with all requirements imposed by the Federal sponsoring agency concerning special requirements of law, program requirements, and other administrative requirements.

10. It will insure that the facilities under its ownership, lease or supervision which shall be utilized in the accomplishment of the project are not listed on the Environmental Protection Agency's (EPA) list of Violation Facilities and that it will notify the Federal grantor agency of the receipt of any communication from the Director of the EPA Office of Federal Activities indicating that a facility to be used in the project is under consideration for listing by the EPA.

† The regulation which we wish to bring to your attention is 10CFR 455.

PART V: ASSURANCES Con't.

11. It will comply with the flood insurance purchase requirements of Section 102 (a) of the Flood Disaster Protection Act of 1973, Public Law 93-234, 87 Stat. 975, approved December 31, 1976. Section 102 (a) requires, on and after March 2, 1975, the purchase of flood insurance in communities where such insurance is available as a condition for the receipt of any Federal financial assistance for construction or acquisition purposes for use in any area that has been identified by the Secretary of the Department of Housing and Urban Development as an area having special flood hazards. The phrase "Federal financial assistance" includes any form of loan, grant, guaranty, insurance payment, rebate, subsidy, disaster assistance loan or grant, or any other form of direct or indirect Federal assistance.

12. It will assist the Federal grantor agency in its compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (16 U.S.C. 470), Executive Order 11593, and the Archeological and Historic Preservation Act of 1966 (16 U.S.C. 469a-1 et seq.) by (a) consulting with the State Historic Preservation Officer on the conduct of investigations, as necessary, to identify properties listed in or eligible for inclusion in the National Register of Historic Places that are subject to adverse effects (see 36CFR Part 800.8) by the activity, and notifying the Federal grantor agency of the existence of any such properties, and by (b) complying with all requirements established by the Federal grantor agency to avoid or mitigate adverse effects upon such properties.

U.S. DEPARTMENT OF ENERGY
Energy Information Administration
Washington, D.C. 20461

FORM APPROVED
OMB NO. 038-R0402

EIA-145

GRANTS PROGRAMS FOR SCHOOLS AND HOSPITALS AND BUILDINGS OWNED BY UNITS OF LOCAL GOVERNMENT AND PUBLIC CARE INSTITUTIONS APPLICATION

PART I: GENERAL INFORMATION

FEDERAL ASSISTANCE

2. APPLICANT'S APPLICATION — a. NUMBER; b. DATE Year month day 19

3. STATE APPLICATION IDENTIFIER — a. NUMBER; b. DATE ASSIGNED Year month day 19

1. TYPE OF ACTION (Mark appropriate box)
- ☐ PREAPPLICATION
- ☒ APPLICATION
- ☐ NOTIFICATION OF INTENT (Opt.)
- ☐ REPORT OF FEDERAL ACTION

Leave blank

SECTION I—APPLICANT/RECIPIENT DATA

4. LEGAL APPLICANT/RECIPIENT
a. Applicant Name :
b. Organizational Unit :
c. Street/P.O. Box :
d. City :
e. County :
f. State :
g. ZIP Code :
h. Contact Person (Name & telephone No.) :

5. FEDERAL EMPLOYER IDENTIFICATION NO.

6. PROGRAM (From Federal Catalog)
a. NUMBER
b. TITLE Grant Programs for Schools and Hospitals and Buildings owned by units of Local Government and Public Care Institutions.

7. TITLE AND DESCRIPTION OF APPLICANT'S PROJECT

8. TYPE OF APPLICANT/RECIPIENT
A-State; B-Interstate; C-Substate District; D-County; E-City; F-Intrast District; G-Special Purpose District; H-Community Action Agency; I-Higher Educational Institution; J-Indian Tribe; K-Other (Specify):
Enter appropriate letter ☐

9. TYPE OF ASSISTANCE
A-Basic Grant; B-Supplemental Grant; C-Loan; D-Insurance; E-Other
Enter appropriate letter(s) ☐☐

10. AREA OF PROJECT IMPACT (Names of cities, counties, States, etc.)

11. ESTIMATED NUMBER OF PERSONS BENEFITING

12. TYPE OF APPLICATION
A-New; B-Renewal; C-Revision; D-Continuation; E-Augmentation
Enter appropriate letter ☐

13. PROPOSED FUNDING

a. FEDERAL	$ .00
b. APPLICANT	.00
c. STATE	.00
d. LOCAL	.00
e. OTHER	.00
f. TOTAL	$ .00

14. CONGRESSIONAL DISTRICTS OF:
a. APPLICANT NA
b. PROJECT NA

16. PROJECT START DATE Year month day 19

17. PROJECT DURATION Months

18. ESTIMATED DATE TO BE SUBMITTED TO FEDERAL AGENCY ▶ Year month day 19

18. TYPE OF CHANGE (For 10e or 10o)
A-Increase Dollars; B-Decrease Dollars; C-Increase Duration; D-Decrease Duration; E-Cancellation; F-Other (Specify):
Enter appropriate letter(s) ☐☐☐

19. EXISTING FEDERAL IDENTIFICATION NUMBER NA

20. FEDERAL AGENCY TO RECEIVE REQUEST (Name, City, State, ZIP code)

21. REMARKS ADDED ☒ Yes ☐ No

SECTION II—CERTIFICATIONS

22. THE APPLICANT CERTIFIES THAT ▶
a. To the best of my knowledge and belief, data in this preapplication/application are true and correct, the document has been duly authorized by the governing body of the applicant and the applicant will comply with the attached assurances if the assistance is approved.

b. If required by OMB Circular A-95 this application was submitted, pursuant to its procedures thereto, to appropriate clearinghouses and all responses are attached:

	No response	Response attached
(1)	☐	☐
(2)	☐	☐
(3)	☐	☐

NA

23. CERTIFYING REPRESENTATIVE
a. TYPED NAME AND TITLE
b. SIGNATURE
c. DATE SIGNED Year month day 19

SECTION III—FEDERAL AGENCY ACTION

24. AGENCY NAME

25. APPLICATION RECEIVED Year month day 19

26. ORGANIZATIONAL UNIT

27. ADMINISTRATIVE OFFICE

28. FEDERAL APPLICATION IDENTIFICATION

29. ADDRESS

30. FEDERAL GRANT IDENTIFICATION

31. ACTION TAKEN
- ☐ a. AWARDED
- ☐ b. REJECTED
- ☐ c. RETURNED FOR AMENDMENT
- ☐ d. DEFERRED
- ☐ e. WITHDRAWN

32. FUNDING

a. FEDERAL	$ .00
b. APPLICANT	.00
c. STATE	.00
d. LOCAL	.00
e. OTHER	.00
f. TOTAL	$ .00

33. ACTION DATE ▶ Year month day 19

34. STARTING DATE Year month day 19

35. CONTACT FOR ADDITIONAL INFORMATION (Name and telephone number)

36. ENDING DATE Year month day 19

37. REMARKS ADDED ☐ Yes ☐ No

38. FEDERAL AGENCY A-95 ACTION
a. In taking above action, any comments received from clearinghouses were considered. If agency response is due under provisions of Part I, OMB Circular A-95, it has been or is being made. NA
b. FEDERAL AGENCY A-95 OFFICIAL (Name and telephone no.) NA

EIA-145

FORM APPROVED
OMB NO. 038-R0402

PART I: GENERAL INFORMATION Con't.

NOTE: If application is for more than one building, attach a separate "Remarks" section for each building.

SECTION IV—REMARKS

39.0 What is the name and address of the building? _____

40.0 What type of building is it?

(a) ☐ School Facility

(b) ☐ Hospital Facility

(c) ☐ Building owned and primarily occupied by Unit of Local Government

(d) ☐ Building owned and primarily occupied by Public Care Institution

41.0 What is the functional use of the building?

(a) ☐ School

- ☐ Elementary
- ☐ Secondary
- ☐ College/University
- ☐ Vocational
- ☐ Other, specify:_____

(b) ☐ Hospital

- ☐ General
- ☐ Tuberculosis
- ☐ Other, specify:_____

(c) ☐ Local Government Building

- ☐ Office
- ☐ Storage
- ☐ Service
- ☐ Library
- ☐ Other, specify:_____

(d) ☐ Public Care Building

- ☐ Nursing Home
- ☐ Long-Term Care
- ☐ Rehabilitation Facility
- ☐ Public Health Center
- ☐ Residential Child Care Ctr.
- ☐ Other, specify:_____

42.0 What is the size of the building?

_____gross sq. ft.

43.0 Is the building a public or non-profit institution?

(a) ☐ Public (b) ☐ Non-profit

44.0 What is the current building energy consumption rate?_____BTU/sq. ft./yr.

45.1 What is the estimated or actual energy savings resulting from implementation of operations and maintenance procedures?

(a) ☐ Estimated
☐ Actual

(b)_____BTU/sq. ft./yr.

45.2 Where are the operations and maintenance procedures identified?

(a) ☐ Energy Audit (b) ☐ Technical Assistance Project

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STANDARD FORM 424 PAGE 2 (Rev. 4-77)

PART I: GENERAL INFORMATION Con't.

NOTE: If application is for more than one building, attach a separate "Remarks" section for each building.

SUPPLEMENTAL SECTION IV - REMARKS

39.0a What is the name and address of building? _____

40.0a What type of building is it?

(a) ☐ School Facility

(b) ☐ Hospital Facility

(c) ☐ Building owned and primarily occupied by Unit of Local Government

(d) ☐ Building owned and primarily occupied by Public Care Institution

41.0a What is the functional use of the building?

(a) ☐ School

- ☐ Elementary
- ☐ Secondary
- ☐ College/University
- ☐ Vocational
- ☐ Other, specify: _____

(b) ☐ Hospital

- ☐ General
- ☐ Tuberculosis
- ☐ Other, specify: _____

(c) ☐ Local Government Building

- ☐ Office
- ☐ Storage
- ☐ Service
- ☐ Library
- ☐ Other, specify: _____

(d) ☐ Public Care Building

- ☐ Nursing Home
- ☐ Long-Term Care
- ☐ Rehabilitation Facility
- ☐ Public Health Center
- ☐ Residential Child Care Ctr.
- ☐ Other, specify: _____

42.0a What is the size of the building?

_____ gross sq. ft.

43.0a Is the building a public or non-profit institution?

(a) ☐ Public (b) ☐ Non-profit

44.0a What is the current building energy consumption rate? _____ BTU/sq. ft./yr.

45.1a What is the estimated or actual energy savings resulting from implementation of operations and maintenance procedures?

(a) ☐ Estimated ☐ Actual (b) _____ BTU/sq. ft./yr.

45.2a Where are the operations and maintenance procedures identified?

(a) ☐ Energy Audit (b) ☐ Technical Assistance Project

PART I: GENERAL INFORMATION Con't.

NOTE: If application is for more than one building, attach a separate "Remarks" section for each building.

SUPPLEMENTAL SECTION IV - REMARKS

39.0b What is the name and address of the building?_____

40.0b What type of building is it?

(a) ☐ School Facility

(b) ☐ Hospital Facility

(c) ☐ Building owned and primarily occupied by Unit of Local Government

(d) ☐ Building owned and primarily occupied by Public Care Institution

41.0b What is the functional use of the building?

(a) ☐ School

- ☐ Elementary
- ☐ Secondary
- ☐ College/University
- ☐ Vocational
- ☐ Other, specify:_____

(b) ☐ Hospital

- ☐ General
- ☐ Tuberculosis
- ☐ Other, specify:_____

(c) ☐ Local Government Building

- ☐ Office
- ☐ Storage
- ☐ Service
- ☐ Library
- ☐ Other, specify:_____

(d) ☐ Public Care Building

- ☐ Nursing Home
- ☐ Long-Term Care
- ☐ Rehabilitation Facility
- ☐ Public Health Center
- ☐ Residential Child Care Ctr.
- ☐ Other, specify:_____

42.0b What is the size of the building?

_____gross sq. ft.

43.0b Is the building a public or non-profit institution?

(a) ☐ Public (b) ☐ Non-profit

44.0b What is the current building energy consumption rate?_____BTU/sq. ft./yr.

45.1b What is the estimated or actual energy savings resulting from implementation of operations and maintenance procedures?

(a) ☐ Estimated ☐ Actual (b)_____BTU/sq. ft./yr.

45.2b Where are the operations and maintenance procedures identified?

(a) ☐ Energy Audit (b) ☐ Technical Assistance Project

EIA-145

FORM APPROVED
OMB NO. 038-R0402

PART II: PROJECT APPROVAL INFORMATION

Item 1.
Does this assistance request require State, local, regional, or other priority rating?
X Yes ____ No

Name of Governing Body ____
Priority Rating ____

Item 2.
Does this assistance request require State, or local advisory, educational or health clearances?
X Yes ____ No

Name of Agency or Board ____
(Attach Documentation)

Item 3.
Does this assistance request require clearinghouse review in accordance with OMB Circular A-95?
____ Yes X No

(Attach Comments)
Exempted from requirements of A-95 by OMB on June 19, 1978.

Item 4.
Does this assistance request require State, local, regional or other planning approval?
X Yes ____ No

Name of Approving Agency ____
Date ____

Item 5.
Is the proposed project covered by an approved comprehensive plan?
X Yes ____ No

Check one: State X
Local ____
Regional ____
Location of Plan ____

Item 6.
Will the assistance requested serve a Federal installation?
____ Yes X No

Name of Federal Installation ____
Federal Population benefiting from Project ____

Item 7.
Will the assistance requested be on Federal land or installation?
____ Yes X No

Name of Federal Installation ____
Location of Federal Land ____
Percent of Project ____

Item 8.
Will the assistance requested have an impact or effect on the environment?
____ Yes ____ No

See instructions for additional information to be provided.

Item 9.
Will the assistance requested cause the displacement of individuals, families, businesses, or farms?
____ Yes X No

Number of:
Individuals ____
Families ____
Businesses ____
Farms ____

Item 10.
Is there other related assistance on this project previous, pending, or anticipated?
____ Yes ____ No

See instructions for additional information to be provided.

Item 11
Is the project in a designated flood hazard area?
____ Yes ____ No

See instructions for additional information to be provided.

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ETA-145

FORM APPROVED
OMB NO. 038-R0402

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No. (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1.		$	$	$	$	$
2.						
3.						
4.						
5. TOTALS		$	$	$	$	$

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity (1)	(2)	(3)	(4)	Total (5)
a. Personnel	$	$	$	$	$
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies					
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$	$	$	$	$
l. Program Income	$	$	$	$	$

Page 4

EIA-145

FORM APPROVED
OMB NO. 038-R0402

PART III: BUDGET INFORMATION Con't.

SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) APPLICANT	(c) STATE	(d) OTHER SOURCES	(e) TOTALS
8.	$	$	$	$
9.				
10.				
11.				
12. TOTALS	$	$	$	$

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$	$	$	$	$
14. Non-Federal					
15. TOTAL	$	$	$	$	$

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS)			
	(b) FIRST	(c) SECOND	(d) THIRD	(e) FOURTH
16.	$	$	$	$
17.				
18.				
19.				
20. TOTALS	$	$	$	$

SECTION F - OTHER BUDGET INFORMATION

(Attach additional Sheets If Necessary)

21. Direct Charges:

22. Indirect Charges:

23. Remarks:

PART IV PROGRAM NARRATIVE (Attach per instruction)

FEDERAL REGULATIONS

This section contains complete copies of Federal regulations pertaining to Grants Program for Schools and Hospital and Buildings Owned by Units of Local Government and Public Care Institutions.

federal register

Monday
April 2, 1979

Part VI

Department of Energy

Energy Measures and Energy Audits Grant Programs for Schools and Hospitals and Buildings Owned by Units of Local Government and Public Care Institutions

DEPARTMENT OF ENERGY

10 CFR Parts 450, 455

Energy Measures and Energy Audits; Grant Programs for Schools and Hospitals, and Buildings Owned by Units of Local Government and Public Care Institutions

AGENCY: Department of Energy.
ACTION: Final Rule.

SUMMARY: The Department of Energy (DOE) is issuing final regulations to establish grant programs, subject to cost sharing requirements, to reduce consumption, and associated costs, of conventional energy resources in (1) schools and hospitals, and (2) buildings owned by units of local government and public care institutions. This objective is to be achieved through several means, including financial assistance for:

(a) Identifying improved operating and maintenance procedures;

(b) Identifying energy conservation measures, including solar energy or other renewable source measures; and

(c) Implementation, in the case of schools and hospitals, of selected energy conservation measures, including solar energy or renewable resource measures.

Financial assistance under these regulations will be provided through grants which the Secretary may award to States for the conduct of preliminary energy audits and energy audits. A State may participate in either the program for schools and hospitals, or the program for units of local government and public care institutions, or both. Preliminary energy audits and energy audits are part of a larger program which will also provide financial assistance for technical assistance and energy conservation measures; regulations governing the latter programs were proposed and published in the FEDERAL REGISTER on January 5, 1979 (44 FR 1580).

EFFECTIVE DATE: April 2, 1979.

FOR FURTHER INFORMATION CONTACT:
Michael Willingham, Director, Office of State-Specific Programs, Room 4117, 20 Massachusetts Avenue, NW., Department of Energy, Washington, D.C. 20545, Telephone: (202) 376-4149.

Lewis W. Shollenberger, Jr., Office of the General Counsel, Room 3224, 20 Massachusetts Avenue, NW., Department of Energy, Washington, D.C. 20545, Telephone: (202) 376-9472.

A. Introduction

On December 12, 1978, DOE Published a proposed rule (43 FR 58158) to establish a program for preliminary energy audits (PEA) and energy audits (EA) of schools and hospitals, and buildings owned by units of local government and public care institutions.

DOE received 150 written comments and 58 persons testified at hearings held in Washington, D.C.; Chicago, Illinois; and San Francisco, California; January 8 and 9, 1979. Many suggestions were made, a number of which resulted in changes to the final rule.

With the issuance of this final rule, DOE amends Chapter II of Title 10, Code of Federal Regulations, to establish a program to provide financial assistance to conduct preliminary energy audits and energy audits of schools and hospitals, and buildings owned by units of local government and public care institutions, pursuant to Title III of the National Energy Conservation Policy Act (NECPA), Pub. L. 95-619, 92 Stat. 3206 *et seq.*

Preliminary energy audits of schools and hospitals, and of buildings owned by units of local government and public care institutions, are a State responsibility. They are performed to provide the State a basis for making a reasonable estimate of the number and characteristics of buildings owned by eligible institutions which qualify for assistance for the conduct of energy audits. The preliminary energy audit information is to be used in the development of the State plan for technical assistance and energy conservation measures, including solar energy or other renewable resource measures. It may be impossible to perform preliminary energy audits for all eligible institutions within the time available. Therefore, provision has been made to allow States to perform preliminary energy audits on a sampling basis for purposes of developing the State plan. It is essential that the sample, if taken, be followed by an identification of all eligible institutions, and together with the buildings owned by them, so that there is a listing of institutions and buildings which qualify for participation in the program. This information, together with data developed from the preliminary energy audits, will enable a State to establish criteria for determining which institutions should receive priority for assistance in the conduct of energy audits. The preliminary energy audit is designed to gather information and does not require a walk-through of the building by a trained auditor. Energy audits, which incorporate the preliminary energy audit data elements, do require a trained auditor to visit the building and make an on-site inspection. The energy audit is to identify changes in operating and maintenance procedures which could save energy. In addition, the energy audit is to indicate how great a need and potential exists for energy conservation, measures, including solar energy or other renewable resource measures.

B. Notice of Grant Program Cycle

DOE has elected to use a grant program cycle for the preliminary energy audit and energy audit portion of the program as well as for the technical assistance and energy conservation measure portion of the program. For purposes of the preliminary energy audit and energy audit program, the grant program cycle is initiated as of the date of publication of this final rulemaking. State applications for financial assistance under this regulation are due thirty days from this date unless an extension of time is requested and approved. Table 1 presents the amounts allocated to States for the first grant program cycle. These allocations are based on fiscal year 1978 appropriations in the amounts of $20 million for schools and hospitals, and $7.5 million for units of local government and public care institutions. Except as may otherwise be specified by the Secretary, this first grant program cycle shall terminate September 30, 1979.

TABLE 1

State	Allocation factor	Schools and hospitals	Units [1]
Alabama	.0163	$325,921	$122,220
Alaska	.0100	$199,184	$74,694
Arizona	.0119	$238,883	$89,581
Arkansas	.0115	$230,851	$86,494
California	.0729	$1,458,598	$546,974
Colorado	.0143	$286,815	$107,556
Connecticut	.0157	$313,050	$117,394
Delaware	.0070	$140,501	$52,688
District of Columbia	.0076	$152,401	$57,150
Florida	.0312	$624,480	$234,180
Georgia	.0204	$408,081	$153,023
Hawaii	.0067	$133,957	$50,234
Idaho	.0087	$174,118	$65,294
Illinois	.0419	$838,702	$314,513
Indiana	.0227	$453,809	$170,178
Iowa	.0158	$309,517	$116,069
Kansas	.0129	$258,950	$97,106

TABLE 1—Continued

State	Allocation factor	Schools and hospitals	Units [1]
Kentucky	.0161	$321,662	$120,710
Louisiana	.0167	$333,129	$124,822
Maine	.0100	$199,738	$74,902
Maryland	.0186	$369,366	$138,523
Massachusetts	.0243	$486,787	$182,545
Michigan	.0353	$706,848	$264,993
Minnesota	.0199	$397,056	$148,897
Mississippi	.0120	$240,966	$90,363
Missouri	.0208	$416,579	$156,218
Montana	.0091	$182,986	$68,589
Nebraska	.0111	$221,833	$83,187
Nevada	.0072	$143,094	$53,660
New Hampshire	.0060	$179,299	$67,237
New Jersey	.0290	$580,963	$217,831
New Mexico	.0089	$177,440	$66,540
New York	.0837	$1,674,325	$477,872
North Carolina	.0222	$443,618	$166,357
North Dakota	.0096	$191,831	$71,881
Ohio	.0400	$799,999	$299,850
Oklahoma	.0139	$277,530	$104,077
Oregon	.0124	$248,714	$93,268
Pennsylvania	.0437	$873,290	$327,484
Rhode Island	.0085	$169,209	$63,453
South Carolina	.0136	$272,121	$102,048
South Dakota	.0089	$178,025	$66,759
Tennessee	.0184	$367,706	$137,890
Texas	.0446	$892,824	$334,809
Utah	.0099	$198,229	$74,336
Vermont	.0060	$160,893	$60,335
Virginia	.0211	$421,992	$158,210
Washington	.0168	$336,652	$126,245
West Virginia	.0111	$221,930	$83,224
Wisconsin	.0213	$425,453	$159,545
Wyoming	.0078	$155,998	$58,499
American Samoa	.0050	$99,418	$37,282
Guam	.0050	$100,434	$37,663
Puerto Rico	.0141	$282,480	$105,930
Virgin Island	.0052	$104,126	$39,047
U.S. total	1.0000	$19,998,870	$7,499,972

[1] Units of local government and public care institutions.

C. Summary of Major Comments on the Proposed Rule and DOE Response

DEFINITIONS—Four comments were received concerning leased buildings occupied by eligible institutions. NECPA provides that financial assistance is to be made available for buildings "owned" by eligible institutions. Therefore, buildings occupied on a lease arrangement do not qualify for financial assistance under this program. However, in some cases, a lease is used as a means of acquiring ownership. A definition of the term "owned" has been added to the rule to make it clear that leased buildings, title to which will transfer to the lessee at the end of the lease period, may also be qualified to participate in this program. Other comments regarding the definition of "building" pointed out that in exceptionally moderate climates there are many buildings owned by eligible institutions which have neither heating or cooling systems, but which could save energy through changes to lighting and hot water systems. DOE is constrained to use the definition provided by NECPA which limits eligible "buildings" to those which are heated or cooled. The absence of any reference to hot water systems in the definition, unlike the definition of the term "building" elsewhere in the Energy Policy and Conservation Act, suggests an intent to preclude such systems from qualifying a building for assistance under these programs. DOE considers a mechanical ventilation system for distributing air throughout a building to be a cooling system and has added a definition of the term "heating or cooling system" to the rule which reflects this view. The purpose of this definition is to clarify conditions of eligibility, and should not be construed as restricting consideration of potential energy conservation opportunities to mechanical heating or cooling systems. On the contrary, all participants in this program should consider all available opportunities, including active and passive solar systems and other renewable resource measures. The definition of "energy conservation measure" has also been clarified to make clear the intent to consider passive solar energy systems, such as solaria or thermal ponds, as well as active solar energy systems.

Several comments addressed the definition of the term "complex". One suggested inclusion of all buildings within a given jurisdiction to be considered a "complex". This suggestion was not adopted since it would result in limiting the amount of financial assistance available under cost limits applicable to energy audits. Two comments requested confirmation that a preliminary energy audit or energy audit could be conducted for a "complex" as well as for individual buildings within the "complex". The rule permits this without a language change, however, either approach must observe the cost limits stated in § 450.46.

Three comments were received regarding the definition of "cooling degree days". These, together with others related to the allocation formula, suggested a higher base for calculation of cooling degree days. The provision of the proposed rule has been retained because it is consistent with both the weather data maintained and published by the National Oceanographic and Atmospheric Administration and general engineering practice.

Two comments criticized the definition of "gross square feet" because it allowed inclusion of space which is not heated or cooled such as parking garages. One of the major purposes of defining the term is to permit comparisons of levels of energy use in similar buildings. Because little energy is used in areas which are neither heated nor cooled, a building which has a parking garage is not truly comparable to a building of the same size which does not. The definition has been modified to exclude areas which are not heated or cooled.

Numerous comments touched on the definitions of eligible institutions. These definitions are important because institutions will be accepted for, or barred from, participation based on whether they meet the test of the definition. Two commenters requested clarification. DOE is of the opinion that the States, as a result of licensing and oversight authorities with respect to eligible institutions, are in the best position to apply the definitions to institutions within their jurisdiction. Two comments asked if community colleges, which do not require a high school diploma or its equivalent for admission, are eligible. The NECPA legislative history suggests that the phrase "recognized equivalent" in the definition includes not only high school equivalency, but also whatever entrance requirements short of a high school

certificate an institution otherwise qualified chooses to impose for admission. A related question asked for clarification of the standards which will apply in determining institutional eligibility for participation in the programs. This question is representative of many which are sure to arise as the program is implemented, and must be answered on a case-by-case basis, depending on whether or not the institution can satisfy the requirements of the appropriate definition. Two comments requested the definitions be changed with regard to treatment of nursing homes. One suggested nursing homes be treated as hospitals. The other favored inclusion of proprietary nursing homes. Neither action is consistent with the provision of NECPA. However, nursing homes which meet the definition of a "public care institution" qualify for participation in the program. For example, a nursing home which is a facility for long-term care, as defined in section 1633 of the Public Health Service Act (42 U.S.C. 300s–3) is eligible for financial assistance under this grant program.

Seven commenters responded to the question of whether to include "parish" and "borough" in the definition of unit of local government. The final rule has been changed to include "parish" and "borough" under the definition of "unit of local government" for clarity. A related question regarding libraries brought 17 responses, all of which favored including libraries in the program. Accordingly, the definition of the term "unit of local government" has been expanded to describe those libraries which are eligible to participate in the programs. Two comments recommended that the definitions specify other buildings, such as police stations and fire stations, as buildings owned by units of local government. The language of the definition is sufficient, but police and fire stations were added to the categories of buildings owned by units of local government listed in § 450.42, "Contents of a preliminary energy audit", to clarify the intent.

One comment requested inclusion of head start centers under the definition of "school", and two comments sought inclusion of community action agency buildings under "unit of local government". Both are actions which DOE considers to be beyond the authority given in NECPA. However, buildings occupied by such agencies which meet the qualification requirements of either a "school" or "public care institution" as stated in the definitions are eligible to participate in the program.

One comment suggested the definitions of "State health facilities agency" and "State educational facilities agency" be expanded to permit the use of Boards. No change is necessary, as the proposed definitions allow the States discretion to use Boards if there is no agency currently in existence which is broadly representative of institutions in each category.

CONTENT OF A PRELIMINARY ENERGY AUDIT—The "Content of a preliminary energy audit" section defines the information requirements for this activity. This includes identification of the institution, basis for eligibility, description of the functional use of the building, owner of record, size, age, operating schedule, major energy using systems, building characteristics related to the potential use of solar energy or renewable resource measures, energy use and cost data by fuel type, energy use in Btu, an energy use index, and a brief description of energy conservation activities. Preliminary energy audits are to be conducted by States to establish the information base needed for development of State Plans which will be used in the subsequent phase of the grant programs to administer technical assistance and energy conservation measures, including solar energy or other renewable resource measures.

Three comments were made concerning the relevance of considering solar applications under this program. DOE is committed to early consideration of solar and other renewable resource applications. It must be recognized that detailed evaluations and specific recommendations can come only as a result of technical assistance work. The information gathered in the preliminary energy audit and energy audit phase should be useful for making a judgment as to whether a particular building has potential for solar energy or other renewable resource applications. Several data elements intended to provide information necessary to make a preliminary judgment about the potential for solar energy and renewable resource measures have been added to the preliminary energy audit requirements in the final rule so this important information is available for State use in preparing State plans for technical assistance and energy conservation measures, including solar energy or other renewable resource measures.

Suggestions were made that DOE expand this section to require the inclusion of such items as blueprints, drawings, and copies of previous reports. Such expansion would add significantly to the cost of the preliminary energy audit with little benefit to the program. Two comments suggested the States be allowed to categorize buildings as they deem most suitable. However, consistency of building categories is necessary to allow DOE to aggregate the data for the nation. One comment recommended the energy use index include consideration of degree days. Again, this would increase the complexity of the preliminary energy audit, the cost of which appears to outweigh the potential benefits. One comment asked that preliminary energy audit reports be published. DOE does not agree this should be made a requirement, but it should be noted the results of the preliminary energy audits will be described in the State plan for technical assistance and energy conservation measures, including solar energy and other renewable resource measures, under the subsequent portion of the overall program. Of course, reports furnished to DOE will be available to the public in accordance with the Freedom of Information Act.

Four comments questioned the requirement for collecting energy use and cost information for the previous twelve month period. Three recommended allowing States discretion for selecting a year consistent with data availability and a potential need for uniformity. DOE accepted the suggestion and modified the text of the final rule accordingly. The forth comment recommended collection of data for at least two years. More extensive data is desirable, but such a requirement would not be consistent with the need to perform preliminary energy audits economically.

Twenty-five comments were received concerning the Btu conversion factors. Most recommended adoption of a point-of-use conversion factor for electricity. As reflected in the proposal, DOE selected a conversion factor for electricity that approximates the energy required to generate and transmit a kilowatt hour of electricity. The conversion factor adopted for use in conducting preliminary energy audits results from comparisons of buildings which indicate that using an index of Btu per square foot can more accurately indicate conservation potential if electricity used is converted to the Btu's at the point of generation. The requirement for use of this conversion factor in the conduct of preliminary energy audits is not intended to preclude the use of different conversion factors for other purposes.

One comment requested DOE provide a list of existing audit techniques which it would consider acceptable for preliminary energy audits or energy audits. However, a determination as to whether the requirements of existing audit techniques are consistent with this rule, and whether the actual work associated with those audits met such requirements is dependent on the particular circumstances involved. States should be able to determine when previously accomplished work conforms to the requirements of this program.

CONTENT OF AN ENERGY AUDIT—The energy audit is a brief on-site survey and analysis of a building, its energy use patterns, identification of opportunities for saving energy through implementation of operating and maintenance changes, and an assessment of its need for implementation of energy conservation measures, including solar energy or other renewable resource measures. The information regarding energy use patterns is the same as that required by a preliminary energy audit, except that it should provide further data needed for analysis of energy conservation potential. In addition, some data elements have been added as a result of concerns expressed by several comments that the proposed rule did not provide an adequate basis for making a judgment about solar or renewable energy resource potential. The identification of operating and maintenance procedure changes which could save energy is important because there are many such actions that can easily be identified and frequently save substantial amounts of energy. Finally, the energy audit is aimed at making an overall estimate of the potential for retrofit and solar or renewable resource applications. Some simple energy conservation measures may be analyzed to obtain an approximation of their costs and benefits. The results of the energy audit, in addition to providing recommendations to owners and managers concerning actions they can take to save energy at little or no cost, also provide basic information which will be used to select buildings to receive technical assistance grants under the later phases of the programs. In this respect, it is extremely important to audit as many buildings as possible because the information gathered serves as a basis for indicating priority of need for technical assistance which rigorously evaluates both solar energy and other conservation actions.

Five comments requested adopting requirements in this section for consideration of specific products or additional operating and maintenance checks. DOE considers it inappropriate to specify consideration of named products, as this might be interpreted as an endorsement. DOE also concluded that expansion of the energy audit requirements would be unduly burdensome. Seven comments suggested the level of detail be reduced or that some items be made optional. DOE considers each item in the requirements for an energy audit to be justified, and some degree of consistency is essential to the effectiveness of the overall program by providing information which can be used to select buildings to receive technical assistance.

Eleven requests for clarification were received concerning subparagraph (b)(1) or § 450.43, which provides a waiver of the need to use the checklist in subparagraph (b)(2). As background, it should be understood that the purpose of this paragraph is to allow institutions which have aggressively pursued energy conservation through changes in operating and maintenance procedures to omit the portion of the energy audit requiring an evaluation of such actions. The 20 percent reduction in energy use specified is not a target which must be met through the energy audit. Neither is it intended that institutions be able to take credit for energy use reductions resulting from weather variances, retrofit actions, or changes in occupancy patterns. It was suggested that DOE set a base year in this section, but DOE is indifferent concerning the base year, so long as factors other than operating and maintenance actions are equivalent in the base year and the year of comparison. This section has been expanded in the final rule to require similarity of weather conditions in the base year and year of comparison.

Two comments asked whether a single specification for the content of an energy audit was appropriate in view of differing code and operational requirements. The requirements are stated in terms of principles which may be applicable to a greater or lesser degree as a result of codes or operating constraints. For example, consideration of lighting levels is required, but obviously the potential reduction differs for a drafting room as compared with a hallway. The applicable code and operating requirements are properly a matter to be covered as an element of State training. Accordingly, DOE has retained the provisions of the proposed rule.

Two comments were directed toward the requirement concerning the plan for scheduled preventive maintenance. The proposed rule, as published, did not reflect DOE's objective merely to require the auditor to examine any existing scheduled preventive maintenance plan. This error has been corrected in the final rule.

Two comments stated objections to the provision that States could add requirements to those in the rule. DOE prefers to retain the provision because it gives States flexibility to consider items not listed which may facilitate the use of programs already in place or allow States to address problems peculiar to their circumstances. However, language has been added to make it clear that such additions shall not be so extensive as to significantly increase the cost of an energy audit.

Three comments asked that DOE establish a dollar limit to distinguish between an operating and maintenance action and a capital improvement. The practical difficulty is that most eligible institutions have their own limits which could vary from $50 to $5,000. In addition, the distinction is not critical to the conduct of an energy audit under these grant programs.

Eleven comments touched on the issue of audits performed without the use of Federal funds. There are no provisions under this program for reimbursement for work performed independently (a point discussed in more detail under the section on cost sharing). However, such audits may satisfy the prerequisite for application for a technical assistance grant, and that aspect of the issue will be addressed in conjunction with the final rule on the technical assistance portion of the overall program. One of the comments, however, went on to suggest that the rule allow any work done using the Public Schools Energy Conservation Survey (PSECS) to be accepted as an energy audit. This cannot be done for several reasons, but primarily because NECPA requirements cannot adequately be addressed short of an on-site examination which PSECS does not require. However, DOE does regard PSECS as a useful tool which can be used by States advantageously in conducting energy audits.

AUDITOR QUALIFICATIONS—The person conducting an energy audit must be familiar with the systems and operations of the type of building to be audited. He or she must also have received State training, or have education and experience such that the State determines training is unnecessary. The energy audit is to be conducted using materials provided by the State. The auditor need not be a professional architect or engineer so long as he or she meets the qualification requirements established by the State.

Seven comments suggested that only professional architects or engineers are qualified to conduct energy audits. Nine comments favored the proposed provision allowing use of technical personnel of less than professional stature. A major objective of those who suggest the use of professional personnel is to do a more thorough energy audit. This is worthwhile, but in many cases it would increase the cost of the energy audit significantly, which in turn would reduce the numbers of institutions which could receive assistance. DOE does not object to the use of professional personnel as such, and those institutions which are willing to pay any extra costs from their own resources should feel free to employ them. It was also suggested that only a professional could properly evaluate complex systems or assume responsibility for changes which could affect health and safety of building occupants. DOE concurs, but such considerations are not within the purview of an energy audit required under this program. Regarding complex systems, it is considered feasible for the energy auditor to identify conditions which could potentially save energy but which require professional judgment and expertise to evaluate. On the health and safety aspect, the results of the energy audit are recommendations only. Implementation is a prerogative of the building owner or manager, and consideration of health and safety implications are normally part of the building owner's or manager's responsibility. Those who supported the language of the proposed rule felt it was important to use their own personnel (except the operator of the building audited) to perform energy audits. DOE agrees, because training to perform energy audits should increase the capacity of the institution to manage its energy resources.

Several related suggestions were made concerning the possible use of engineers or architects as resources which could be called upon by the energy auditor in cases where he or she has a question, as supervisors for energy auditors, or at the State level in the development and implementation of the energy audit programs. DOE has partially adopted the last suggestion by adopting a provision that architects or engineers must be used in conducting auditor training, and further urges States to consider using professionals as resource personnel for supervision of groups of auditors. In a similar vein, two comments favored the use of a team to conduct energy audits, and one asked if the use of a team was a requirement. Since the proposed language would permit States to employ professionals in the manner suggested and allows either an individual or a team to perform the energy audit, DOE has made no change.

Eight comments were received concerning the provision that energy audits be conducted by someone other than the person responsible for the day-to-day operation of the building. Opinion was equally divided between retaining and deleting the provision. Since the accuracy and extent of results from an energy audit depend on questions of whether and when actions are taken in operating the building, it is important to assure objectivity. Therefore, the provision has been retained. However, the provision is not intended to preclude building operators from participating in the audit if they are supervised by the energy auditor.

One comment suggested that the rule state classes of persons who are qualified to perform energy audits. This is a question which is better left to the discretion of the States and the language of the proposed rule has been retained. Another comment questioned whether the rule permitted only the use of "in-house" auditors or if an energy audit could be performed by contractors or State personnel. Any of these arrangements are permitted.

One comment pointed out that more complex buildings might require a more highly qualified auditor and suggested the States should be allowed to set requirements according to the need. Since the proposed rule merely says States will establish auditor qualifications, the approach recommended is permitted.

A question was raised concerning the provision for financial disclosure. This is not intended to prohibit any particular person from performing an energy audit, but only to assure disclosure of any potential biases. Neither does the requirement extend to quantification of a financial interest as in providing a financial statement. In general, if the energy auditor owns, has stock in, or is employed by (1) a firm which provides consulting services in the energy field, (2) a manufacturer of equipment which could save energy, or (3) an energy supplier, that fact should be stated in the audit report.

AUDIT REPORTS—The report on the results of the energy audit is a record of findings and recommendations. A copy of the report is to be submitted to the owner or manager of the building for such action as may be deemed appropriate. The report is also forwarded to the State for its use in managing the program and reporting results.

DOE solicited suggestions on how owners and managers could be encouraged to act on recommendations resulting from energy audits. Four were received, and one that suggested the audit report advise owners and managers that implementation of recommendations would be a factor in considering applications for technical assistance support was incorporated into the final rule.

Information compiled by, or on behalf of, an eligible institution and contained in a preliminary energy audit or energy audit report shall be available for public release unless, in accordance with the Freedom of Information Act, a proper claim of confidentiality is made.

COST OF AN ENERGY AUDIT—The provisions governing cost limits are intended to be used for calculating the maximum amount of Federal assistance available for conducting an energy audit of any given building or complex. The limits were established to define the extent of the work involved and assure equitable treatment of all eligible institutions. They do not preclude States or institutions from spending more than the amounts cited, but all of the funds above these amounts must come from non-Federal sources. The cost limits recognize that more effort is required to audit a large building than a small building, but the scale is not based strictly on gross square feet. This is because a substantial part of the cost of an energy audit is expected to be the training of the energy auditor, and is the same regardless of building size. Also, larger buildings tend to have large sections which are duplicates of one another, so less effort per square foot is required.

Twenty-three comments were received which expressed the opinion the cost limits proposed were too low. Most favored increasing the allowance sufficiently to permit the use of professional personnel to conduct the energy audit. For reasons already discussed, DOE has not adopted that position. Three comments raised points considered valid by DOE. One was that buildings in remote locations could require an additional allowance to provide for the expense of travel. The second was that small institutions having only a few buildings would not be able to prorate the expense of sending an auditor to be trained and still conduct energy audits within the cost limits. Finally, it was suggested that some allowance be made for unusually complex buildings. The final rule incorporates an exception procedure

whereby the cost limits can be increased by a State to deal with these circumstances. However, a State may not use more than 15 percent of its allocation in any grant program cycle for such purposes.

Four comments suggested clarification of the provision for a complex, one of which also identified the need for a ceiling on the allowance for a complex. Changes have been made in the final rule in response to these comments.

FINANCIAL ASSISTANCE—The financial assistance section states to whom grants may be awarded.

Six comments suggested the rule provide a mechanism whereby units of local government and public care insititutions could apply directly to DOE for grant assistance. DOE has retained the proposed procedure to promote timely administration of the grant program. This objective can best be assured by allowing each State to process all requests for financial assistance.

COST SHARING—The preliminary energy audit/energy audit program is a matching grant program. This section deals with the requirement for matching funds, an exception procedure, credit to States for certain energy audit program costs and sources of matching funds.

Twenty-three comments were received concerning the provisions governing Federal matches above the 50 percent level. Eight of these wanted the rule to provide for grants in excess of the 50 percent limit for units of local government and public care institutions, as is allowed for schools and hospitals. Such action would go beyond the authority of NECPA. The balance of the comments primarily sought clarification of the manner in which the exception provision operates. An illustration should suffice. Suppose a State's preliminary energy audit and energy audit allocation is $200,000, of which no more than 25 percent, or $50,000, is to be used by the State for conducting preliminary energy audit, providing training of energy auditors and managing the program. Assume further that this State can arrange for matching funds from institutions in the amount of $150,000 to match the amount available to conduct energy audits, but has only $20,000 available for its match and requests a partial waiver of the 50 percent match provision giving as justification that the additional funds can be obtained only through appropriation by the State legislature, and not from any other source, and that the legislature is not scheduled to meet for six months. Should DOE accept this justification, the State would receive a grant of $200,000. Because it did not fully match the $50,000, the amount of the unmatched funds, $30,000, would be deducted from the State's future allocations for technical assistance and energy conservation measures and redistributed to all other States. Because the preliminary energy audit and energy audit program plays a fundamental role in the preparation of State Plans and selection of candidates for technical assistance, as well as providing significant potential energy savings from energy audits, DOE intends to waive the 50% match requirement only where essential to allow States to participate in the program, and then only to the extent clearly justified by the State. Further, any relaxation of the match requirements results in a lesser amount being available to do the audits. In the example above, were the State to make its 50 percent match, there would be $100,000 available instead of $70,000 to cover preliminary energy audits and other State expenses.

Three comments suggested that the goods or services acceptable as an in-kind match be specified in the rule. The omission of such a list was deliberate, and places no restrictions on in-kind contributions other than those imposed by the Office of Management and Budget Circular A-102, dated September 12, 1977 (42 FR 45828), entitled "Uniform Administrative Requirements for Grants-in-Aid to State and Local Governments".

One comment asked whether the match had to be made on each energy audit, or if the State could simply assure the requirement was met on a Statewide basis. The rule requires the match be met on each energy audit to meet requirements of NECPA and to assure equitable distribution of funds among eligible insititutions.

Sixteen comments asked for a change to the provision of the proposed rule concerning credit for work already accomplished. Most wanted a date earlier than November 9, 1978; of these, several mentioned April 20, 1977. Additionally, it was suggested that the provision be broadened to include activities beyond those related to preliminary energy audits. DOE has not adopted the suggestion with regard to the date change. The conference committee report accompanying NECPA indicates that project costs incurred prior to November 9, 1978, are not to be considered eligible for grant funding. Suggestions to broaden coverage of this provision were partially adopted. States may request that the cost of work commenced on or after November 9, 1978, in the conduct of preliminary energy audits and energy audits be counted toward their matching requirements, and the Secretary may allow such requests, when, in her or his judgment, the work has substantially contributed to early achievement of program objectives.

Two comments questioned whether or not medicare and medicaid funds are considered to be derived from other than Federal sources. For purposes of this rule and to the extent that such payments are made as reimbursements for services rendered to individuals, such monies are not considered by DOE to be Federal funds for State matching purposes. DOE recognizes that other situations may occur, as in the case of funds available from Federal loans or payments made in lieu of taxes. DOE will consider these on a case-by-case basis. Six comments requested deletion of the restriction on use of funds from Federal sources entirely. This is not possible because of NECPA limitations.

ALLOCATION OF FUNDS—The allocation of funds section states the method by which DOE will allocate funds among States. There are two separate appropriations, one for schools and hospitals and another for units of local government and public care institutions. A single formula is used, and the amount available to each State is determined by multiplying the allocation factor resulting from the formula by the amount appropriated.

Nineteen comments received pertained to the allocation formula. Most suggested greater weight be placed on climate, especially heating degree days. One objective of the program is to audit as many eligible buildings as possible. Also, climate is not a major consideration with respect to energy savings which may be possible through changes in operating and maintenance procedures. Several related comments recommended modifying the calculation of cooling degree days by raising the base temperature. While in some buildings cooling is not required until the outside temperature reaches 70° or 75°, others require cooling at temperatures well below 65°. For these reasons, DOE did not change the weight given climate, and the 65° base has been retained in the allocation formula.

In the course of investigating the comments on this subject, some errors were discovered in the climate data published in the proposed rule. These have been corrected, and a revised Table 2 is presented below to display the results. Because the data also affect the allocation factor, a revised Table 3 is also presented.

TABLE 2

State	Heating degree (days)	Cooling degree (days)	State share (HDD + CDD)	State share x.2
Alabama	2,696	1,969	0.0135	0.0027
Alaska	12,012	0	0.0340	0.0068
Arizona	2,290	2,694	0.0142	0.0028
Arkansas	3,214	1,962	0.0147	0.0029
California	2,726	999	0.0098	0.0020
Colorado	7,004	328	0.0211	0.0042
Connecticut	6,139	397	0.0191	0.0038
Delaware	4,780	1,021	0.0167	0.0033
District of Columbia	4,756	1,416	0.0177	0.0035
Florida	704	3,398	0.0117	0.0023
Georgia	2,964	1,989	0.0131	0.0026
Hawaii	0	3,530	0.0101	0.0020
Idaho	6,917	416	0.0211	0.0042
Illinois	6,658	980	0.0202	0.0040
Indiana	5,713	962	0.0192	0.0038
Iowa	6,834	976	0.0222	0.0044
Kansas	4,900	1,543	0.0185	0.0037
Kentucky	4,414	1,254	0.0163	0.0033
Louisiana	1,701	2,636	0.0125	0.0025
Maine	8,002	222	0.0237	0.0047
Maryland	4,782	1,015	0.0167	0.0033
Massachusetts	6,232	487	0.0193	0.0039
Michigan	6,739	588	0.0211	0.0042
Minnesota	8,729	473	0.0265	0.0053
Mississippi	2,411	2,223	0.0133	0.0027
Missouri	5,004	1,332	0.0183	0.0037
Montana	8,292	236	0.0245	0.0049
Nebraska	6,347	1,099	0.0214	0.0043
Nevada	4,370	1,500	0.0189	0.0034
New Hampshire	7,535	297	0.0225	0.0045
New Jersey	5,470	877	0.0189	0.0037
New Mexico	4,766	972	0.0166	0.0033
New York	6,998	677	0.0198	0.0036
North Carolina	3,262	1,454	0.0139	0.0028
North Dakota	9,484	421	0.0286	0.0057
Ohio	5,779	797	0.0198	0.0036
Oklahoma	3,508	2,003	0.0158	0.0032
Oregon	5,254	183	0.0157	0.0031
Pennsylvania	5,756	723	0.0186	0.0037
Rhode Island	5,924	445	0.0183	0.0037
South Carolina	2,997	1,886	0.0132	0.0026
South Dakota	7,881	801	0.0244	0.0049
Tennessee	3,901	1,456	0.0151	0.0030
Texas	2,015	2,999	0.0136	0.0027
Utah	6,580	630	0.0207	0.0041
Vermont	7,873	293	0.0235	0.0047
Virginia	4,266	1,113	0.0156	0.0031
Washington	5,752	171	0.0170	0.0034
West Virginia	5,106	649	0.0171	0.0034
Wisconsin	7,531	541	0.0232	0.0046
Wyoming	7,595	326	0.0236	0.0047
American Samoa	0	5,325	0.0153	0.0031
Guam	0	5,011	0.0144	0.0029
Puerto Rico	0	4,907	0.0141	0.0028
Virgin Islands	0	5,427	0.0156	0.0031
U.S. total	270,449	77,290	1.0000	0.2000

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TABLE 3

State	.1 x 1/N + .7 x SP/NP + .2 x SC/NC = Allocation factor			
Alabama	.0018	.0118	.0087	.0183
Alaska	.0018	.0012	.0088	.0100
Arizona	.0018	.0073	.0028	.0119
Arkansas	.0018	.0068	.0029	.0115
California	.0018	.0692	.0059	.0729
Colorado	.0018	.0083	.0042	.0143
Connecticut	.0018	.0100	.0039	.0157
Delaware	.0018	.0019	.0033	.0070
District of Columbia	.0018	.0023	.0035	.0076
Florida	.0018	.0271	.0023	.0312
Georgia	.0018	.0180	.0026	.0204
Hawaii	.0018	.0039	.0030	.0087
Idaho	.0018	.0027	.0042	.0087
Illinois	.0018	.0361	.0040	.0419
Indiana	.0018	.0170	.0038	.0227
Iowa	.0018	.0082	.0044	.0155
Kansas	.0018	.0074	.0037	.0129
Kentucky	.0018	.0110	.0033	.0161
Louisiana	.0018	.0123	.0025	.0167
Maine	.0018	.0034	.0047	.0100
Maryland	.0018	.0138	.0033	.0188
Massachusetts	.0018	.0187	.0038	.0243
Michigan	.0018	.0293	.0042	.0353
Minnesota	.0018	.0127	.0053	.0198
Mississippi	.0018	.0076	.0027	.0120
Missouri	.0018	.0154	.0037	.0208
Montana	.0018	.0024	.0049	.0091
Nebraska	.0018	.0050	.0043	.0111
Nevada	.0018	.0020	.0034	.0072
New Hampshire	.0018	.0029	.0043	.0090
New Jersey	.0018	.0236	.0037	.0290
New Mexico	.0018	.0038	.0033	.0089
New York	.0018	.0581	.0038	.0637
North Carolina	.0018	.0178	.0026	.0222
North Dakota	.0018	.0021	.0057	.0096
Ohio	.0018	.0344	.0038	.0400
Oklahoma	.0018	.0089	.0032	.0139
Oregon	.0018	.0075	.0031	.0124
Pennsylvania	.0018	.0381	.0037	.0437
Rhode Island	.0018	.0030	.0037	.0085
South Carolina	.0018	.0092	.0026	.0136
South Dakota	.0018	.0022	.0049	.0089
Tennessee	.0018	.0135	.0030	.0184
Texas	.0018	.0401	.0027	.0446
Utah	.0018	.0039	.0041	.0099
Vermont	.0018	.0015	.0047	.0080
Virginia	.0018	.0182	.0031	.0211
Washington	.0018	.0118	.0034	.0188
West Virginia	.0018	.0059	.0034	.0111
Wisconsin	.0018	.0148	.0048	.0213
Wyoming	.0018	.0013	.0047	.0078
American Samoa	.0018	.0001	.0031	.0050
Guam	.0018	.0003	.0029	.0050
Puerto Rico	.0018	.0095	.0028	.0141
Virgin Islands	.0018	.0003	.0031	.0052
U.S. total	.1000	.7000	.2000	1.0000

While a building census would be the ideal basis for the major factor in the allocation formula, reliable and generally accepted data are not available. DOE is required by NECPA to consider population and climate, and has weighted population most heavily because it is the best available indicator of building numbers. One comment pointed out that more densely populated States are likely to have fewer, but larger, buildings per capita than other States. However, the equal share portion of the formula has a countervailing effect. Another comment suggested increasing the amount to be shared equally, but that would give less populous States far more than an equitable share of the funds on a per capita basis. For these reasons, the allocation formula set forth in the proposed rule has been retained.

SUBMISSION AND REVIEW OF APPLICATIONS—This section states the procedures which shall be used in submitting and processing grant applications under this Subpart.

Six comments stated the time allowed for submission of applications in the first grant program cycle is not sufficient. It would be preferable if circumstances were such that more time could be made available for the preparation and submission of applications. However, NECPA requires that preliminary energy audits be conducted and the results incorporated in State Plans required for later phases of this program shortly after publication of the applicable final rule. The timetable is such that, at best, there are about 120 days available in which to conduct preliminary energy audits. Extending the time for submission of preliminary energy audit/energy audit applications would almost certainly require a later submission of State Plans. The requirement for submission of applications was retained. However, while DOE discourages such requests, both the proposed and final rule provide the States may request and be granted additional time if necessary.

Five comments requested an avenue be established for units of local government and public care institutions to appeal to DOE during the review period when a State application is considered unsatisfactory by such institutions. DOE does not anticipate a need for such a procedure. However, should an eligible institution be aggrieved by any action taken by either a State or DOE with respect to this program, such grievances may be presented to either a State or DOE, or both. Eight other comments suggested strengthening the provisions for consultation with representatives of affected institutions prior to submission of the State application. One recommended that public hearings be required. However desirable and beneficial more extensive consultation might be, the time limits on submitting the application preclude making this requirement more stringent.

Five comments recommended reducing the number of copies of the application required to be submitted. The provision of the proposed rule has been changed to require one instead of ten copies. One comment requested the Governor be allowed to delegate authority to sign the State application. The definition of the term "Governor" includes his designee, so there is no bar to such delegation of authority.

CONTENT OF APPLICATION—The time limit for submitting applications is also reflected in the content of the application. A large part of the application must necessarily be a statement of how the State intends to implement the program, rather than a detailed description of what has been done in preparation. An example of the distinction can be seen in the provision for equitable apportionment of allotted funds among eligible institutions. Because of the time constraints, the application is to describe how the funds are to be apportioned. For example, to assure equitable treatment of rural institutions as compared with urban institutions, a State could indicate it planned to allot funds proportionally to the gross square feet of buildings owned by eligible institutions. Were more time available, the provision would more likely call for the amounts apportioned to each sub-category of eligible institutions. Similarly, the provision requiring disclosure of the sources, amounts, and intended use of non-Federal funds is to be taken as a description of sources of the funds to be obtained by both the State and participating institutions, rather than an identification of institutions by name and the amounts each is to contribute. The information requested in the application is a result of the provisions of NECPA, the requirements of the Office of Management and Budget, and DOE program management requirements. This information is the minimum necessary to provide adequate information on which to base a decision to approve or disapprove an application.

Eight comments were directed toward the provision for conducting preliminary energy audits on a sampling basis. It was recommended that the rule provide the method for sampling. Such guidance is not appropriate for incorporation in the rule. DOE will provide such a methodology to States for their consideration and possible use.

Nine comments suggested DOE set minimum requirements for auditor training. The proposed rule made this primarily a State responsibility since States are best able to deal with a number of significant variables including code requirements, programs already in place, level of qualifications required and the material adopted for conducting energy audits. Accordingly, this provision of the proposed rule has been retained in the final. However, the provision has been expanded to require that States use professional architects or engineers to participate in conducting the training sessions.

Two comments suggested that regional commissions or other coordinating bodies be allowed to apply on behalf of groups of eligible institutions. DOE has no objection to State development and use of such procedures. Such an arrangement must, of course, be acceptable to the affected institutions as well. One comment expressed a general concern about equity of treatment of rural institutions relative to urban institutions. The rule requires States to develop and describe procedures for equitable allocation of funds when resources are insufficient to provide energy audits to all eligible institutions. It will be DOE's responsibility to review the equity aspects of these State procedures.

Two comments objected to allowing States to conduct energy audits or provide services to support the conduct of energy audits as well as making grant funds available to the institutions to conduct the energy audits. It was suggested the rule require States to make grant funds available to eligible institutions. DOE agrees in principle that the intent of these programs is to assure preliminary energy audits and energy audits of eligible institutions, and that making funds available to eligible institutions may be the preferred method for conducting energy audits. At the same time, however, there are circumstances under which a cash payment would be less economical than some alternative method of conducting an energy audit. In other cases, an institution might not have the capability or desire to conduct its own energy audit. Accordingly, language has been added to the rule which requires that a State specify in its application the procedures by which assistance will be provided to institutions willing and able to undertake their own energy audits.

Two comments suggested that States be required to notify institutions of the availability of assistance and the amounts. There is a requirement for a State to institute such a notification as part of its implementation, and this has been made explicit in the final rule. Also, States should plan to use preliminary energy audit and energy audit funds within one year of the date of the notice of grant award, in order that the technical assistance and energy conservation measures phase of the program can be implemented quickly. One comment suggested a requirement that persons administering the program at the State level have at least one year's experience managing a building. DOE prefers to allow States maximum latitude to use personnel having backgrounds which will enable the State to implement the programs quickly and effectively. Therefore, this suggestion was not adopted. One comment raised a question as to whether it is reasonable to require State adoption of specific material, such as a workbook, for the conduct of energy audits before the State application is submitted. This question appears to stem from a misunderstanding of the provision which requires a State to describe the material it intends to adopt to conduct energy audits. Such a description is not considered excessively onerous. A copy of the material finally adopted is required to be submitted with a State's second quarterly report.

USE OF FUNDS—NECPA imposed a number of constraints on the manner in which funds may be used in this program. Other limits such as the requirement that at least 75 percent of the State allocation be used in conducting energy audits, are established by DOE in support of the objectives of the program.

Twenty comments were received concerning the sublimits placed on the use of funds within the 25 percent maximum available to the State for administrative expenses, development of materials, training of personnel, conduct of preliminary energy audits, monitoring and evaluation. There was general agreement the 25 percent limit was appropriate, but several States pointed out that alternative methods of implementation could be used. Depending on the degree of emphasis placed on various activities, some effective and economical methods of implementation might be excluded if the sublimits contained in the proposed rule were retained in the final rule. DOE has reconsidered, and the sublimits have been removed from the final rule. Also, from a number of comments it was clear there was some confusion about whether the costs of training auditors were to be borne by the State or charged to the performance of energy audits. It is intended that the time and expense of the individuals being trained be charged to the expense associated with the performance of energy audits. Only the time and expense of the instructor, and the cost of the materials, space, and related expenses are considered training expenses chargeable to the State. This point is clarified in the final rule.

One comment questioned what level of sampling would be considered adequate in connection with the State responsibility for quality control and follow-up to determine the extent to which recommendations in the energy audit have been implemented. The number chosen for purposes of this monitoring and evaluation sample will depend on variables such as the number of trained auditors available. As a general rule, a sample of between one and five percent should be adequate. Within these limits, the State should select a sample size it considers appropriate to the purpose.

Two comments criticized the limitation on amounts which could be spent for equipment, favoring an increase to $500. The energy audit is not intended to a be a complex procedure, and there should be a little need for expensive equipment. DOE has adopted in the final rule a limit of $300, consistent with the definition of non-expendable personal property contained in the Office of Management and Budget Circular A-102. Moreover, in exceptional situations where a more expensive item can be justified, provision is made to allow a State to request DOE approval for such expenditure.

One comment questioned whether State expenses in preparing an application are allowable expenses under the proposed rule. DOE considers that such expenses may be allowable as part of the State's matching contribution under the provisions of paragraph (c) of section 455.12. Another comment suggested that seasonal use buildings should be eligible for financial assistance under this program. The limitation stems from the language of NECPA and cannot be changed by DOE. One comment recommended a minimum building size or energy use level be established as a requirement to qualify for energy audit assistance. While such a provision would perhaps enable the program to focus more on buildings having a higher potential for saving energy, it does not seem consistent with the concern for equitable treatment of eligible institutions expressed in NECPA. DOE has, therefore, not adopted such a provision. Four comments were received suggesting there is no reason to exclude the administrative buildings of local educational agencies. DOE has reconsidered the provision, and deleted it from the final rule.

REPORT REQUIREMENTS—DOE regards the reporting requirements incorporated in the rule as the minimum necessary for evaluating the program and tracking State progress in meeting its implementation schedule. Reasonably frequent reporting is a necessity because the preliminary energy audit and energy audit phase of the program will be of short duration.

One comment suggested consolidating the reports required under this program with other reports associated with State grant programs. Because there is little, if any, duplication of information anticipated, DOE has not adopted this approach.

COMMENTS RELATIVE TO TECHNICAL ASSISTANCE AND ENERGY CONSERVATION MEASURES—Forty comments were received which touched on matters associated with the proposed rulemaking governing programs for technical assistance and energy conservation measures published January 5, 1979. For example, comments have been received regarding the definition of "energy conservation measure", procedures for applying for a technical assistance grant, and provisions for using energy audits performed without the use of Federal funds to qualify for technical assistance. These comments are being held and will be considered together with other comments received on that proposed rulemaking.

MISCELLANEOUS—There were a number of comments made about various aspects of the program which cannot be adequately addressed in the context of a specific section or provision, but which are worthy of response.

Four comments proposed that the rule be modified to eliminate duplication between the preliminary energy audit and energy audit so that there is only one inspection of a building under this program. DOE does not anticipate an on-site inspection by a trained auditor will be required to obtain the preliminary energy audit information.

Another set of four comments complained of the multiplicity of activities under the term "energy audit". While acknowledging the possibility of confusion, the terms for this program are

defined by NECPA. In the development of this regulation, an effort has been made to achieve consistency to the extent possible between this program and others of a similar nature.

Three commenters suggested DOE place limits on itself in terms of time to process State applications. Uncertainties remain, including the prospect that some discussions with the States will be necessary after receipt of applications, which makes the establishment of such time limits impractical. However, State applications will be processed as rapidly as possible.

One commenter requested all information concerning the funds available under the program, the timing and relationship between preliminary energy audits, energy audits, technical assistance, and energy conservation measures be made available as soon as possible. DOE is aware of this need and will make this information broadly available as quickly as possible.

Three comments touched on the possibility of transferring funds from the technical assistance and energy conservation measures phase of the overall program to perform energy audits. Such action is clearly beyond the scope of the NECPA authority.

Three comments asked that DOE incorporate forms and procedures in the final rule. States will be invited by letter to participate in this program, and the forms and procedures will be provided by DOE at that time. Two comments suggested that funds for fiscal years 1978 and 1979 be made available in the initial State allocations. DOE has decided against such a consolidation in the interest of sound fiscal administration. Congress has appropriated $200 and $100 million for schools and hospitals in fiscal years 1978 and 1979, respectively. The amount appropriated for units of local government and public care institutions is $25 and $7 million for fiscal years 1978 and 1979, respectively.

Three comments highlighted an apparent inconsistency between the language of § 455.1 and § 455.11. Section 455.1 is general and applies to both preliminary energy audits and energy audits, and to technical assistance and energy conservation measures, while § 455.11 applies only to preliminary energy audits.

As noted in the preamble to the proposed rule, DOE has proposed a rule on nondiscrimination in Federally assisted programs (10 CFR Chapter X, 43 FR 53658, November 16, 1978). When issued as a final rule, detailed guidance will be provided concerning actions necessary to comply with nondiscrimination requirements in all DOE assistance programs. It will apply to this part under the provisions of section 455.3(b). DOE intends to provide a copy of this final rule to all grant recipients under this program. If the necessary civil rights actions are not taken, the grant will be subject to suspension or termination.

D. Environmental Assessment

DOE prepared an environmental assessment of the entire Title III NECPA programs. Notice of the public availability of that environmental assessment, together with the negative determination of environmental impact reached pursuant to an evaluation of the environmental assessment, was published in the Federal Register on March 12, 1979 (44 FR 13554). The negative determination concluded that the Title III NECPA programs did not constitute major Federal actions significantly affecting the quality of the human environment pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*). No material comments were received during the public comment and review. Consequently, DOE will act in accordance with that negative determination.

In consideration of the foregoing, Part 450 of Chapter II, Title 10 of the Code of Federal Regulations is amended as follows, and a new Part 455 is added to Chapter II, Title 10 of the Code of Federal Regulations as set forth below. In light of NECPA requirements that this regulation be issued within a specific period after enactment, and in consideration of the urgent need to initiate preliminary energy audits, good cause exists to make this regulation effective upon publication, as indicated in the proposed rule, rather than 30 days thereafter as would otherwise be required by the Administration Procedures Act. Accordingly, these amendments and additions shall be effective upon publication in the Federal Register.

Issued in Washington, D.C., March 26, 1979.

Maxine Savitz,

Deputy Assistant Secretary, Conservation and Solar Applications, Department of Energy.

1. In 10 CFR Part 450, the authority is revised as follows:

Authority: Part C of Title III, Energy Policy and Conservation Act, (42 U.S.C. 6321 *et seq.*), as amended by Part B of Title IV, Energy Conservation and Production Act, and Parts G and H of Title III, Energy Policy and Conservation Act, as added by Title III of the National Energy Conservation Policy Act, 92 Stat. 3206 *et seq.*; Department of Energy Organization Act, (42 U.S.C. 7101 *et seq.*)

PART 450—ENERGY MEASURES AND ENERGY AUDITS

§ 450.1 [Amended]

2. 10 CFR 450.1 is amended by designating the provisions of the first sentence as paragraph (a), the second sentence as paragraph (b) and deleting the word "also" following the word "part" in that sentence, and adding a new paragraph (c) as follows:

• • • • •

(c) This part also provides the requirements for the conduct of preliminary energy audits and energy audits in accordance with Section 393 and Section 400 C of the Energy Policy and Conservation Act, Pub. L. 94–163, 42 U.S.C. 6321, as amended by Title III of the National Energy Conservation Policy Act, Pub. L. 95–619, 92 Stat. 3206 *et seq.*

§ 450.2 [Amended]

3. 10 CFR 450.2 is amended to add a new paragraph (d) as follows:

• • • • •

(d) To establish minimum requirements for the preliminary energy audits and energy audits to be carried out under the program of financial assistance for schools and hospitals and the program of financial assistance for units of local government and public care institutions.

§ 450.3 [Amended]

4. 10 CFR 450.3 is amended by deleting the definitions of "Administrator", "Cooling degree days", "FEA", "Heating degree days", "Regional Administrator" and by adding in the appropriate alphabetical order definitions of "Cooling degree days", "DOE", "Heating degree days", "Regional Representative" and "Secretary" as follows:

• • • • •

"Cooling degree days" means the annual sum of the number of Fahrenheit degrees of each day's mean temperature above 65° for a given locality.

• • • • •

"DOE" means the Department of Energy.

• • • • •

"Heating degree days" means the annual sum of the number of Fahrenheit degrees of each day's mean temperature below 65° for a given locality.

• • • • •

"Regional Representative" means a Regional Representative of the Department of Energy.

• • • • •

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"Secretary" means the Secretary of the Department of Energy.

§ 450.21 [Revised]

5. Paragraph (b)(5) of 10 CFR 450.21 is revised to read as follows:

* * * * * *

(b) * * *

(5) For the purposes of paragraph (b)(4) of this section, the conversion factors set forth in paragraph (a)(12) of § 450.42 shall be used.

6. 10 CFR Part 450 is amended by establishing a new Subpart E as follows:

Subpart E—Preliminary Energy Audits and Energy Audits

Sec.
450.40 Purpose and scope.
450.41 Definitions.
450.42 Contents of a preliminary energy audit.
450.43 Contents of an energy audit.
450.44 Auditor qualifications.
450.45 Audit reports.
450.46 Cost of energy audits.

Authority: Title III of the National Energy Conservation Policy Act, Pub. L. 95-619, 92 Stat. 3206 *et seq.*, which establishes Parts G and H of Title III of the Energy Policy and Conservation Act, Pub. L. 94-163, 42 U.S.C. 6321 *et seq.*; Sec. 365(e)(2), 42 U.S.C. 6325(e)(2), of the Energy Conservation and Production Act, Pub. L. 94-385, 42 U.S.C. 3801 *et seq.*; Department of Energy Organization Act, Pub. L. 95-91, 42 U.S.C. 7101 *et seq.*

Subpart E—Preliminary Energy Audits and Energy Audits

§ 450.40 Purpose and scope.

This subpart establishes requirements for the conduct of preliminary energy audits and energy audits, the qualifications of persons conducting them and allowable costs of energy audits. Preliminary energy audits and energy audits are required in the program of financial assistance for schools and hospitals and the program of financial assistance for units of local government and public care institutions, as provided under Subpart B, Part 455, Chapter II of Title 10, Code of Federal Regulations.

§ 450.41 Definitions.

For purposes of this subpart—

"Building" means any structure, the construction of which was completed on or before April 20, 1977, which includes a heating or cooling system, or both.

"Complex" means a closely situated group of buildings on a contiguous site or a closely situated group of buildings served by a central utility plant, such as a college campus or a multi-building hospital.

"Construction completion" means the date of issuance of an occupancy permit for a building.

"Energy audit" means a survey of a building or complex that is conducted in accordance with the requirements of this subpart which—

(1) Identifies the type, size, energy use level and the major energy using systems;

(2) Determines appropriate energy conservation maintenance and operating procedures; and

(3) Indicates the need, if any, for the acquisition and installation of energy conservation measures, including solar energy and other renewable resource measures.

"Energy conservation maintenance and operating procedure" means modifications in the maintenance and operating procedures of a building, and any installations therein, which are designed to reduce energy consumption in such building and which require no significant expenditure of funds.

"Energy conservation measure" means an installation or modification of an installation in a building which is primarily intended to reduce energy consumption or allow the use of an alternative energy source, including, but not limited to—

(1) Insulation of the building structure and systems within the building;

(2) Storm windows and doors, multiglazed windows and doors, heat absorbing or heat reflective glazed and coated windows and door systems, additional glazing, reductions in glass area, and other window and door system modifications;

(3) Automatic energy control systems;

(4) Equipment required to operate variable steam, hydraulic, and ventilating systems adjusted by automatic energy control systems;

(5) Active or passive solar space heating or cooling systems, solar electric generating systems, or any combination thereof;

(6) Active or passive solar water heating systems;

(7) Furnace or utility plant and distribution system modifications including—

(A) Replacement burners, furnaces, boilers, or any combination thereof, which substantially increase the energy efficiency of the heating system;

(B) Devices for modifying flue openings which will increase the energy efficiency of the heating system;

(C) Electrical or mechanical furnace ignition systems which replace standing gas pilot lights; and

(D) Utility plant system conversion measures including conversion of existing oil- and gas-fired boiler installations to alternative energy sources, including coal;

(8) Caulking and weatherstripping;

(9) Replacement or modification of lighting fixtures to increase the energy efficiency of the lighting system without increasing the overall illumination of a building, unless such increase in illumination is necessary to conform to any applicable State or local building code or, if no such code applies, the increase is considered appropriate by the Secretary;

(10) Energy recovery systems;

(11) Cogeneration systems which produce steam or forms of energy such as heat, as well as electricity for use primarily within a building or a complex of buildings owned by a school or hospital and which meet such fuel efficiency requirements as the Secretary may by rule prescribe;

(12) Such other measures as the Secretary identifies by rule for purposes of this part, as set forth in Subpart D of this part; and

(13) Such other measures as a grant application shows will save a substantial amount of energy and as are identified in an energy audit in accordance with Subpart C of this part.

"Fuel" means any commercial source of energy used within the building or complex being surveyed such as natural gas, fuel oil, electricity or coal.

"Gross square feet" means the sum of all heated or cooled floor areas enclosed in a building, calculated from the outside dimensions, or from the centerline of common walls.

"Heating or cooling system" means any mechanical system for heating or cooling areas of a building. For purposes of this subpart, any mechanical system for distributing air throughout the building is considered a cooling system.

"Hospital" means a public or nonprofit institution which is a general hospital, tuberculosis hospital, or any other type of hospital, other than a hospital furnishing primarily domiciliary care; and is duly authorized to provide hospital services under the laws of the State in which it is situated.

"Hospital facilities" means buildings housing a hospital and related facilities, including laboratories, laundries, outpatient departments, nurses' home and training facilities and central service facilities operated in connection with a hospital, and also includes buildings housing education or training facilities for health professions personnel operated as an integral part of a hospital.

"Indian tribe" means any tribe, band, nation, or other organized group or

community of Indians, including any Alaska native village, or regional or village corporation, as defined in or established pursuant to the Alaska Native Claims Settlement Act, Pub. L. 92-203; 85 Stat. 688, which (a) is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; or (b) is located on, or in proximity to, a Federal or State reservation or rancheria.

"Local educational agency" means a public board of education or other public authority or a non-profit institution legally constituted within, or otherwise recognized by, a State for either administrative control or direction of, or to perform administrative services for, a group of schools within a State.

"Maintenance" means activities undertaken in a building to assure that equipment and energy-using systems operate effectively and efficiently.

"Operating" means the operation of equipment and energy-using systems in a building to achieve or maintain specified levels of environmental conditions or service.

"Preliminary energy audit" means a determination of the energy consumption characteristics of a building, including the size, type, rate of energy consumption, and major energy-using systems of such building.

"Public care institution" means a public or non-profit institution which owns—

(1) A facility for long-term care, rehabilitation facility, or public health center, as described in Section 1633 of the Public Health Service Act (42 U.S.C. 300s-3; 88 Stat. 2270);

(2) A residential child care center, which is an institution, other than a foster home, operated by a public or non-profit institution and is primarily intended to provide full-time residential care with an average length of stay of at least 30 days for at least 10 minor persons who are in the care of such institution as a result of a finding of abandonment or neglect or of being persons in need of treatment or supervision.

"Public or nonprofit institution" means an institution owned and operated by—

(1) A State, a political subdivision of a State or an agency or instrumentality of either;

(2) A school or hospital which is, or would be in the case of such entities situated in America Samoa, Guam, Puerto Rico and the Virgin Islands, exempt from income tax under Section 501(c)(3) of the Internal Revenue Code of 1954; or

(3) A unit of local government or a public care institution which is, or would be in the case of such entities situated in America Samoa, Guam, Puerto Rico and the Virgin Islands, exempt from income tax under Section 501(c)(3) or 501(c)(4) of the Internal Revenue Code of 1954.

"School" means a public or nonprofit institution which—

(1) Provides, and is legally authorized to provide, elementary education or secondary education, or both on a day or residential basis;

(2)(A) Provides, and is legally authorized to provide, a program of education beyond secondary education, on a day or residential basis;

(B) Admits as students only persons having a certificate of graduation from a school providing secondary education, or the recognized equivalent of such certificate;

(C) Is accredited by a nationally recognized accrediting agency or association; and

(D) Provides an educational program for which it awards a bachelor's degree or higher degree or provides not less than a two-year program which is acceptable for full credit toward such a degree at any institution which meets the preceding requirements and which provides such a program;

(3) Provides not less than a one-year program of training to prepare students for gainful employment in a recognized occupation and which meets the provisions cited in subdivisions (A), (B), and (C) of subparagraph (2) above; or

(4) Is a local education agency.

"School facilities" means buildings housing classrooms, laboratories, dormitories, athletic facilities, or related facilities operated in connection with a school.

"State" means, in addition to the several States of the Union, the District of Columbia, Puerto Rico, Guam, American Samoa, and the Virgin Islands.

"Unit of local government" means the government of a county, municipality, parish, borough, or township, which is a unit of general purpose government below the State, determined on the basis of the same principles as are used by the Bureau of the Census for general statistical purposes; the District of Columbia, American Samoa, Guam and the Virgin Islands; the recognized governing body of an Indian tribe which governing body performs substantial governmental functions; libraries owned by any of the foregoing; and public libraries which serve all residents of a political subdivision below the State level, such as a community, district or region, free of charge and which derive at least 40 percent of their operating funds from tax revenues of a taxing authority below the State level.

§ 450.42 Contents of a preliminary energy audit.

(a) A preliminary energy audit shall provide a description of the building or complex audited and determine its energy-using characteristics, including—

(1) The name or other identification, and address of the building;

(2) A statement that the building meets the requirements of one of the following categories—

(i) A school facility;

(ii) A hospital facility; or

(iii) A building owned and primarily occupied either by offices or agencies of a unit of local government or by a public care institution, neither of which shall include any building intended for seasonal use or any building used primarily by a school or hospital;

(3) A description of the functional use made of the building identifying whether it is a—

(i) School—

(A) Elementary;

(B) Secondary;

(C) College or university;

(D) Vocational;

(E) Local education agency administrative building; or

(F) Other;

(ii) Hospital—

(A) General;

(B) Tuberculosis; or

(C) Other;

(iii) Local government building—

(A) Office;

(B) Storage;

(C) Service;

(D) Library;

(E) Police station;

(F) Fire station; or

(G) Other; or

(iv) Public care building—

(A) Nursing home;

(B) Long term care other than a nursing home;

(C) Rehabilitation facility;

(D) Public health center; or

(E) Residential child care center;

(4) The name and address of the owner of record, indicating whether owned by a public institution, private nonprofit institution or an Indian tribe;

(5) The size of the building, expressed in gross square feet;

(6) The age of the building;

(7) Approximate daily hours of operation, including periods of partial use if applicable;

(8) An indication of whether the building is partially used during vacation periods or other times when

the building is not fully utilized, for periods of a week or more, by quarter;

(9) An identification of major energy-using systems, including—

(i) Type of heating system or cooling system or both;

(ii) Fuel used for heating system, cooling system;

(iii) Fuel used for domestic hot water, such as electric or natural gas;

(iv) Special energy using systems, such as food service or laundry; and

(v) Lighting, such as incandescent or fluorescent;

(10) Fuel use in physical units and cost data by type for a preceding 12 month period, by month if practicable, using actual data or an estimate if actual figures are unavailable;

(11) Total annual energy use expressed in Btu's per gross square foot and energy cost per gross square foot. Energy use shall be calculated using the conversion factors set forth below—

(i) Electricity—11,800 Btu per kilowatt hour.

(ii) Natural gas—1,030 Btu per cubic foot.

(iii) Distillate fuel oil—138,690 Btu per gallon.

(iv) Residual fuel oil—149,690 Btu per gallon.

(v) Coal—24.5 million Btu per standard short ton.

(vi) Liquified petroleum gases including propane and butane—95,475 Btu per gallon.

(vii) Steam—1,300 Btu per pound.

Conversion factors may be taken from engineering reference manuals for fuels not listed.

(b) A preliminary energy audit shall provide a brief description of activities which have been undertaken to conserve energy in the building or complex being audited, including whether—

(1) A person has been designated to monitor and evaluate energy use;

(2) Work partially or fully satisfying the requirements of an energy audit has been performed;

(3) Detailed studies have been conducted by architects, engineers or architect-engineer teams of energy use and energy conservation; and

(4) Any major energy conservation measures have been implemented, together with a listing of such measures, and estimates of their costs and energy savings if available.

(c) A preliminary energy audit shall provide information regarding site, building, and heating and hot water systems related to solar energy or other renewable resource potential including—

(1) An indication of whether open land, such as fields, yards and parking areas, is available within the immediate vicinity of the building which is not heavily shaded by tall buildings, trees or other obstructions;

(2) A statement of whether the building is located generally within an urban, suburban or rural area;

(3) An approximation of whether more than half the building's roof area or southern oriented wall surface is heavily shaded by shrubs, trees, buildings or other obstructions for more than about four hours per day;

(4) The number of stories;

(5) A general description of the building's shape, such as square, rectangular, E-shaped, H-shaped or L-shaped;

(6) An indication of whether the roof is flat or pitched, and if pitched whether it has a southern orientation;

(7) Whether there are existing roof-top obstructions, such as chimneys, space conditioning equipment, water towers, mechanical rooms, stairwells or other permanent structures;

(8) An indication of the exterior material of the southern facing wall, such as masonry, wood, aluminum;

(9) An approximation of the proportion of glass area of the southern facing wall, such as less than 25 percent, 25–75 percent, more than 75 percent;

(10) Location of primary space heating and water heating systems—

(i) Whether outside of or within the building;

(ii) If within the building, whether on the ground floor, in the basement, or on the roof; and

(iii) If within the building, whether centrally located, in multiple units, or a combination thereof.

§ 450.43 Contents of an energy audit.

(a) An energy audit shall contain the information required for a preliminary energy audit, in accordance with § 450.42, and shall also include a description of—

(1) Major changes in functional use or mode of operation planned in the next fifteen years, such as demolition, disposal, rehabilitation, or conversion from office to warehouse;

(2) For a building in excess of 200,000 gross square feet, if available—

(i) Peak electric demand for both daily and annual cycles; and

(ii) Annual energy use by fuel type of the major mechancial or electrical systems if the information is available or can be reasonably estimated;

(3) Terminal heating or cooling, or both, such as radiators, unit ventilators, fancoil units, or double-duct reheat systems;

(4) Building site and structual characteristics related to solar energy or other renewable resource potential, including but not limited to—

(i) Climatic factors, specifically—

(A) Average annual heating degree days and cooling degree days;

(B) Average solar insolation by month;

(C) Average monthly wind speed; and

(ii) Roof characteristics, including—

(A) An identification of primary structural component such as steel, wood, concrete; and

(B) Type of roofing material such as shingles, slate, or built-up materials; and

(5) A description of general building conditions.

(b) An energy audit shall—

(1) Indicate that appropriate energy conservation maintenance and operating procedures have been implemented for the building, supported by a demonstration based on actual records, that energy use has been reduced in a given year through changes in maintenance and operating procedures, by not less than 20 percent from a corresponding base period having a degree day variance of less than 10 percent; or

(2) Recommend appropriate energy conservation maintenance and operating procedures, on the basis of an on-site inspection and review of any scheduled preventive maintenance plan, together with a general estimate or range of energy and cost savings if practical, which may result from—

(i) Effective operation of ventilation systems and control of infiltration conditions, including—

(A) Repair of caulking or weatherstripping around windows and doors;

(B) Reduction of outside air intake, shutting down ventilation systems in unoccupied areas, and shutting down ventilation systems when the building is not occupied; and

(C) Assuring central or unitary ventilation controls, or both, are operating properly;

(ii) Changes in the operation of heating or cooling systems through—

(A) Lowering or raising indoor temperatures;

(B) Locking thermostats;

(C) Adjusting supply or heat transfer medium temperatures; and

(D) Reducing or eliminating heating or cooling at night or at times when a building or complex is unoccupied;

(iii) Changes in the operation of lighting systems through—

(A) Reducing illumination levels;

(B) Maximizing use of daylight;

(C) Using higher efficiency lamps; and

(D) Reducing or eliminating evening cleaning of buildings;

(iv) Changes in the operation of water systems through—

(A) Repairing leaks;

(B) Reducing the quantity of water used, e.g., flow restrictors;

(C) Lowering settings for hot water temperatures;

(D) Raising settings for chilled water temperatures; and

(v) Changes in the maintenance and operating procedures of the utility plant and distribution system through—

(A) Cleaning equipment;

(B) Adjusting air/fuel ratio;

(C) Monitoring combustion;

(D) Adjusting fan, motor, or belt drive systems;

(E) Maintaining steam traps; and

(F) Repairing distribution pipe insulation; and

(vi) Such other actions as the State may determine useful or necessary, consistent with the purposes of the energy audit and acceptable cost constraints of section 450.46.

(c) Based on information gathered under paragraphs (a) and (b) of § 450.42, and paragraphs (a)(1) and (2) of this section, an energy audit shall indicate the need, if any, for the acquisition and installation of energy conservation measures and shall include an evaluation of the need and potential for retrofit based on consideration of one or more of the following—

(1) An energy use index or indices, for example, Btu's per gross square foot per year;

(2) An energy cost index or indices, for example, annual energy costs per gross square foot; or

(3) The physical characteristics of the building envelope and major energy-using systems.

(d) Based on information gathered under paragraph (c) of § 450.42 and subparagraph (a)(4) of this section, an energy audit shall include an indication of whether building conditions or characteristics present an opportunity for use of solar heating and cooling systems or solar hot water systems.

(e) An energy audit may include an assessment of the estimated costs and energy and cost savings likely to result from the purchase and installation of one or more energy conservation measures.

§ 450.44 Auditor qualifications.

Subject to the approval of the Secretary, a State shall develop procedures for establishing the qualifications of auditors who will conduct energy audits in accordance with Subpart B of 10 CFR Part 455 which—

(a) Ascertain that a person conducting the energy audit is qualified by virtue of successful completion of an approved training program or demonstration of equivalent skills gained by prior training and experience, together with familiarity with the systems and operations of the types of buildings being audited.

(b) Assure that the person responsible for the energy audit is not the person directly responsible for the day-to-day operation of the building being audited.

(c) Assure disclosure by an auditor of her or his financial interests relating to the energy audit or any energy conservation measures, including solar energy or renewable resource measures, reviewed or recommended by the audit.

§ 450.45 Audit reports.

(a) The results of a preliminary energy audit or an energy audit, conducted in accordance with the requirements of this subpart, shall be contained in an audit report. Unless a claim of confidentiality is made by an audited institution based upon a specific provision of the Freedom of Information Act, 5 U.S.C. 552, and both the claim and reason for confidentiality are submitted with the audit report or within 10 days from the date the owner receives the report, an audit report shall be considered public information and will be made available for public review upon request.

(b) Preliminary energy audit reports and energy audit reports shall be furnished to the State, and the owner and operator of the building audited.

(c) An audit report for an energy audit shall include a statement signed by the auditor that—

(1) The auditor meets the applicable qualifications as set forth in § 450.44;

(2) The auditor has indicated any financial interests in accordance with § 450.44; and

(3) The audit was conducted in accordance with the requirements of § 450.43.

(d) The audit report shall state that implementation of energy conservation maintenance and operating procedures are a condition for eligibility for receiving Federal assistance under the technical assistance program, described in 10 CFR Part 455.

§ 450.46 Cost of energy audits.

(a) Except as provided in paragraph (b) of this section, the allowable cost of an energy audit under this program for the purpose of calculating the Federal share thereof, shall not exceed the following—

Building gross square feet	Allowable cost for calculating Federal share
Up to 30,000	$400.00
30,000 to 100,000	$500.00
100,000 and above	$600.00
Complex	(1)

(1) The sum of individual building allowances for the first 100,000 gross square feet, and 60 percent of individual building allowances above 100,000 gross square feet but not to exceed $10,000.

(b) Where necessary, States may increase the allowable cost of a particular energy audit, provided that the total of all such increases does not exceed 15 percent of the applicable State allocation. A State may permit increases for—

(1) The amount necessary to enable personnel from insitutions having few buildings or in remote locations to attend training sessions qualifying them to perform energy audits;

(2) The amount necessary to provide transportation to perform energy audits of buildings in remote locations; and

(3) The amount necessary to conduct energy audits for a building having an unusually complicated system or configuration; however, this increase may not exceed 50 percent of the allowable cost for an individual building.

PART 455—GRANT PROGRAMS FOR SCHOOLS AND HOSPITALS AND BUILDINGS OWNED BY UNITS OF LOCAL GOVERNMENT AND PUBLIC CARE INSTITUTIONS

7. Subchapter D, Chapter II of Title 10 Code of Federal Regulations, is amended by establishing Part 455 as follows:

Subpart A—General Provisions

Sec.

455.1 Purpose and scope.
455.2 Definitions.
455.3 Administration of grants.
455.4 Recordkeeping.
455.5 Suspension and termination of grants.

Subpart B—Preliminary Energy Audit and Energy Audit Grant Procedures

455.10 Purpose and scope.
455.11 Financial assistance.
455.12 Cost sharing.
455.13 Allocation of funds.
455.14 Submission and review of applications.
455.15 Content of applications.
455.16 Use of funds.
455.17 Reporting requirements.

Authority: Title III of the National Energy Conservation Policy Act, Pub. L. 95-619, 92 Stat. 3206 *et seq.*, which establishes Parts G and H of Title III of the Energy Policy and Conservation Act, Pub. L. 94-163, (42 U.S.C. 6321 *et seq.*); sec. 365(e)(2), (42 U.S.C. 6325(e)(2), of the Energy Conservation and

Production Act, Pub. L. 94-385, (42 U.S.C. 6801 *et seq.*); Department of Energy Organization Act, Pub. L. 95-91, (42 U.S.C. 7101 *et seq.*)

Subpart A—General Provisions

§ 456.1 Purpose and scope.

(a) This part establishes programs of financial assistance pursuant to Parts 1 and 2 of Title III of the National Energy Conservation Policy Act, Pub. L. 95-619, 92 Stat. 306 *et seq.*, which adds Parts G and H, respectively, to Title III of the Energy Policy and Conservation Act, Pub. L. 94-163, 42 U.S.C. 6321 *et seq.*

(b) This subpart authorizes grants to States or to public or non-profits schools and hospitals to assist them in conducting preliminary energy audits and energy audits, in identifying and implementing energy conservation maintenance and operating procedures and in evaluating, acquiring and installing energy conservation measures, including solar energy or other renewable resource measures, to reduce the energy use and anticipated energy costs of buildings owned by schools, and hospitals.

(c) This subpart also autorizes grants to States or units of local government and public care institutions to assist them in conducting preliminary energy audits and energy audits, in identifying and implementing energy conservation maintenance and oprating procedures and in evaluating energy conservation measures, including solar energy or other renewable resources measures, to reduce the energy use and anticipated energy costs of buildings owned by units of local government and public care institutions.

§ 456.2 Definitions.

"Act", as used in this part, means the Energy Policy and Conservation Act, Pub. L. 94-163, 42 U.S.C. 6321 *et seq., as amended* by the National Energy Conservation Policy Act, Pub. L. 95-619, 92 Stat. 3206.

"Auditor" means any person who is qualified in accordance with 10 CFR 450.44 to conduct an energy audit.

"Building" means any structure, the construction of which was completed on or before April 20, 1977, which includes a heating or cooling system, or both.

"Complex" means a closely situated group of buildings on a continguous site, or a closely situated group fo buildings served by a central utility plant, such as a college campus or a multi-building hospital.

"Construction completion" means the date of issuance of an occupancy permit for a building.

"Cooling degree days" means the annual sum of the number of Fahrenheit degrees of each day's mean temperature above 65° for a given locality.

"DOE" means the Department of Energy.

"Energy audit" means any survey of a building or complex conducted in accordance with the requirements of Subpart E of 10 CFR Part 450.

"Energy conservation maintenance and operating procedure" means modificating in the maintenance and operations of a building, and any installations therein, which are designed to reduce the energy use in such building and which require no significant expenditure of funds.

"Energy conservation measure" means an installation or modification of an installation in a building which is primarily intended to reduce energy consumption or allow the use of an alternative energy source, including, but not limited to—

(1) Insulation of the building structure and systems within the building;

(2) Storm windows and doors, multiglazed windows and doors, heat absorbing or heat reflective glazed and coated windows and door systems, additional glazing, reductions in glass area, and other window and door system modifications;

(3) Automatic energy control systems;

(4) Equipment required to operate variable steam, hydraulic, and ventilating systems adjusted by automatic energy control systems;

(5) Active or passive solar space heating or cooling systems, solar electric generating systems, or any combination thereof;

(6) Active or passive solar water heating systems;

(7) Furnace or utility plant and distribution system modifications including—

(A) Replacement burners, furnaces, boilers, or any combination thereof, which substantially increase the energy efficiency of the heating system;

(B) Devices for modifying flue openings which will increase the energy efficiency of the heating system;

(C) Electrical or mechanical furnace ignition systems which replace standing gas pilot lights; and

(D) Utility plant system conversion measures including conversion of existing oil and gas-fired boiler installations to alternative energy sources, including coal;

(8) Caulking and weatherstripping;

(9) Replacement or modification of lighting fixtures to increase the energy efficiency of the lighting system without increasing the overall illumination of a facility, unless such increase in illumination is necessary to conform to any applicable State or local building code or, if no such code applies, the increase is considered appropriate by the Secretary;

(10) Energy recovery systems;

(11) Cogeneration systems which produce steam or forms of energy such as heat, as well as electricity for use primarily within a building or a complex of buildings owned by an eligible institution and which meet such fuel efficiency requirements as the Secretary may by rule prescribe;

(12) Such other measures as the Secretary identifies by rule for purposes of this part, as set forth in Subpart D of 10 CFR Part 450; and

(13) Such other measures as a grant application shows will save a substantial amount of energy and as are identified in an energy audit in accordance with Subpart C of 10 CFR Part 450.

"Grantee" means the person named in the Notification of Grant Award as the recipient of the grant.

"Grant program cycle" means the period of time specified by DOE which relates to the fiscal year or years for which monies are appropriated for grants under this part, during which one complete cycle of grant activity occurs, including fund allocations to the States, receipt, applications review, approval or disapproval, and grant awards.

"Governor" means the chief executive officer of a State, including the Mayor of the District of Columbia, or a person duly designated in writing by the Governor to act on her or his behalf.

"Heating or Cooling System" means any mechanical systems for heating or cooling conditioned areas of a building. For purposes of this part, any mechanical system for distributing air throughout the building is considered a cooling system.

"Heating degree days" means the annual sum of the number of Fahrenheit degrees of each day's mean temperature below 65° for a given locality.

"Hospital" means a public or nonprofit institution which is a general hospital, tuberculosis hospital, or any other type of hospital, other than a hospital furnishing primarily domiciliary care; and which is duly authorized to provide hospital services under the laws of the State in which it is situated.

"Hospital facilities" means buildings housing a hospital and related facilities, including laboratories, laundries, outpatient departments, nurses' home and training facilities and central service facilities operated in connection with a hospital, and also includes buildings housing education or training facilities for health professions

personnel operated as an integral part of a hospital.

"Indian tribe" means any tribe, band, nation, or other organized group or community of Indians, including any Alaska native village, or regional or village corporation, as defined in or established pursuant to the Alaska Native Claims Settlement Act, Pub. L. 92-203; 85 Stat. 688, which (a) is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; or (b) is located on, or in proximity to, a Federal or State reservation or rancheria.

"Local educational agency" means a public board of education or other public authority or a nonprofit institution legally constituted within, or otherwise recognized by, a State for either administrative control or direction of, or to perform administrative services for, a group of schools within a State.

"Maintenance" means activities undertaken in a building to assure that equipment and energy-using systems operate effectively and efficiently.

"Native American" means a person who is a member of an Indian tribe.

"Operating" means the operation of equipment and energy-using systems in a building to achieve or maintain specified levels of environmental conditions or service.

"Owned" or "Owns" means a property interest, including without limitation a leasehold interest, which is, or shall become, a fee simple title in a building or complex.

"Preliminary energy audit" means any survey of a building or complex conducted in accordance with the requirements of Subpart E, of 10 CFR Part 450.

"Public care institution" means a public or nonprofit institution which owns—

(1) A facility for long-term care, rehabilitation facility, or public health center, as described in Section 1633 of the Public Health Service Act (42 U.S.C. 300s-3; 88 Stat. 2270); or

(2) A residential child care center, which is an institution, other than a foster home, operated by a public or non-profit institution and is primarily intended to provide full-time residential care with an average length of stay of at least 30 days for at least 10 minor persons who are in the care of such institution as a result of a finding of abandonment or neglect or of being persons in need of, treatment or supervision.

"Public or nonprofit institution" means an institution owned and operated by—

(1) A State, a political subdivision of a State or an agency or instrumentality of either; or

(2) A school or hospital which is, or would be in the case of such entities situated in American Samoa, Guam, Puerto Rico, and the Virgin Islands, exempt from income tax under Section 501(c)(3) of the Internal Revenue Code of 1954; or

(3) A unit of local government or public care institution which is, or would be in the case of such entities situated in American Samoa, Guam, Puerto Rico, and the Virgin Islands, exempt from income tax under Section 501(c)(3) or 501(c)(4) of the Internal Revenue Code of 1954.

"School" means a public or nonprofit institution which—

(1) Provides, and is legally authorized to provide, elementary education or secondary education, or both, on a day or residential basis;

(2)(A) Provides, and is legally authorized to provide, a program of education beyond secondary education, on a day or residential basis;

(B) Admits as students only persons having a certificate of graduation from a school providing secondary education, or the recognized equivalent of such certificate;

(C) Is accredited by a nationally recognized accrediting agency or association; and

(D) Provides an educational program for which it awards a bachelor's degree or higher degree or provides not less than a two-year program which is acceptable for full credit toward such a degree at any institution which meets the preceding requirements and which provides such a program;

(E) Provides not less than a one-year program of training to prepare students for gainful employment in a recognized occupation and which meets the provisions cited in subdivisions (A), (B), and (C) of subparagraph (2) above; or

(4) Is a local educational agency.

"School facilities" means buildings housing classrooms, laboratories, dormitories, athletic facilities, or related facilities operated in connection with a school.

"Secretary" means the Secretary of the Department of Energy.

"State" means, in addition to the several States of the Union, the District of Columbia, Puerto Rico, Guam, American Samoa, and the Virgin Islands.

"State energy agency" means the State agency responsible for developing State energy conservation plans pursuant to Section 362 of the Energy Policy and Conservation Act, or, if no such agency exists, a State agency designated by the Governor of such State to prepare and submit the State plan required under Section 364 of the Energy Policy and Conservation Act, as amended by the Energy Conservation and Production Act.

"State hospital facilities agency" means an existing agency which is broadly representative of the public hospitals and the nonprofit hospitals, or, if no such agency exists, an agency designated by the Governor of such State which conforms to the requirements of this definition.

"State school facilities agency" means an existing agency which is broadly representative of public institutions of higher education, nonprofit institutions of higher education, public elementary and secondary schools, nonprofit elementary and secondary schools, public vocational education institutions, nonprofit vocational education institutions, and the interests of handicapped persons in a State or, if no such agency exists, an agency which is designated by the Governor of such State which conforms to the requirements of this definition.

"Technical assistance" means a program or activity for (1) the conduct of specialized studies to identify and specify energy savings and related cost savings that are likely to be realized as a result of either modifying maintenance and operating procedures in a building, or both, and (2) the planning or administration of such specialized studies. For States, schools and hospitals, which are eligible to receive grants to carry out energy conservation measures, the term also means the planning or administration of specific remodeling, renovation, repair, replacement, or insulation projects related to the installation of energy conservation, solar energy or renewable resource measures in a building.

"Unit of local government" means the government of a county, municipality, parish, borough, or township, which is a unit of general purpose government below the State, determined on the basis of the same principles as are used by the Bureau of the Census for general statistical purposes; the District of Columbia, American Samoa, Guam, and the Virgin Islands; the recognized governing body of an Indian tribe which governing body performs substantial governmental functions; libraries owned by any of the foregoing; and public libraries which serve all residents of a political subdivision below the State level, such as a community, district or region, free of charge and which derive at least 40 percent of their operating

funds from tax revenues of a taxing authority below the State level.

§ 455.3 Administration of grants.

(a) Grants provided under this part shall comply with applicable law including, but without limitation, the requirements of—

(1) Federal Management Circular 73–2, 34 CFR Part 251, entitled "Audit of Federal Operations and Programs by Executive Branch Agencies";

(2) Federal Management Circular 74–4, 34 CFR Part 255, entitled "Cost Principles Applicable to Grants and Contracts with State and Local Governments";

(3) Office of Management and Budget Circular A–102, 42 FR 45828, entitled "Uniform Administrative Requirements for Grants-in-Aid to State and Local Governments";

(4) Office of Management and Budget Circular A–110, 41 FR 32016, entitled "Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Nonprofit Organizations";

(5) Office of Management and Budget Circular A–89, entitled "Catalog of Federal Domestic Assistance";

(6) Office of Management and Budget Circular A–97, entitled "Rules and Regulations Permitting Federal Agencies to Provide Specialized or Technical Services to State and Local Units of Government under Title III of the Intergovernmental Coordination Act of 1968";

(7) Treasury Circular 1082, entitled "Notification to States of Grant-in-Aid Information" and

(8) Civil rights requirements of law administered pursuant to the DOE Organization Act and the following public laws. Title VI of the Civil Rights Act of 1964; Section 16 of the Federal Energy Administration Act of 1974; Section 401 of the Energy Reorganization Act of 1974; Title IX of the Higher Education Amendments of 1972; Section 504 of the Rehabilitation Act of 1973; and the Age Discrimination Act of 1975.

(b) Grants provided under this part shall comply with such additional procedures applicable to this part as DOE may from time to time prescribe for the administration of grants.

§ 455.4 Recordkeeping.

Each State or other entity within a State receiving financial assistance under this part shall make and retain records required by DOE, including records which fully disclose the amount and disposition of the financial assistance received; the total cost of the administration and the activities for which assistance is given or used; the source and amount of any funds not supplied by DOE; and any data and information which DOE determines are necessary to protect the interest of the United States and to facilitate an effective financial audit and performance evaluation. The Secretary, or any of her or his duly authorized representatives, shall have access, until three years after the completion of the activities involved, to any books, documents, receipts or other records which the Secretary determines are related or pertinent, either directly or indirectly, to any financial assistance provided under this part.

§ 455.5 Suspension and termination of grants.

The Secretary may suspend or terminate financial assistance under a previously approved application if the Secretary determines the applicant has failed to comply substantially with the terms and conditions set forth in the application and this part. Suspension and termination procedures shall be as set forth in OMB circulars A–102 and A–110 as applicable.

Subpart B—Preliminary Energy Audit and Energy Audit Grant Procedures

§ 455.10 Purpose and scope.

(a) This subpart contains the regulations whereby the Federal Government shall provide financial assistance for preliminary energy audits and energy audits.

(b) Preliminary energy audits are to be performed by States for the purpose of—

(1) Determining the energy use characteristics of eligible school and hospital facilities, and buildings owned by units of local government and public care insitutions, including the size, type, rate of energy use and major energy using systems of such buildings within the State;

(2) Establishing a data base from which reasonably accurate estimates can be made of the number of eligible institutions, the number of qualifying buildings, and patterns of energy conservation needs including an indication of the opportunities for use of solar or other renewable energy sources; and

(3) Assisting States in development of a sound and complete State Plan which is a prerequisite to receipt of financial assistance for technical assistance or energy conservation, measures, including solar energy or other renewable resource measures.

(c) Energy Audits are to be performed by States or eligible schools, hospitals, units of local government and public care institutions for the purpose of—

(1) Determining the energy use characteristics of eligible school and hospital facilities, and buildings owned by units of local government and public care institutions, including the size, type, rate of energy use and major energy using systems of such buildings within the State;

(2) Identifying and encouraging adoption of energy conservation maintenance and operating procedures;

(3) Indicating potential, if any, for acquiring and installing energy conservation measures, including possible use of solar energy or other renewable resources; and

(4) Providing, to the greatest extent practical, consistent information necessary to identify those buildings to receive priority for additional financial assistance.

§ 455.11 Financial assistance.

(a) DOE shall provide financial assistance from sums appropriated only upon application in accordance with the provisions of this subpart.

(b) The Secretary may make grants for purposes of conducting preliminary energy audits and energy audits of school facilities and hospital facilities.

(c) The Secretary may make grants for purposes of conducting preliminary energy audits and energy audits of buildings owned by units of local government and public care insititutions.

§ 455.12 Cost sharing.

(a) Amounts made available under this subpart, together with any other amounts made available from other Federal sources, may not be used to pay more than 50 percent of the costs of a preliminary energy audit or an energy audit, except as provided in paragraph (b) of this section.

(b) The Governor of a State may request a grant of up to 100 percent of the costs of any preliminary energy audit or energy audit for schools or hospitals. When financial assistance in excess of the 50 percent cost share limitation is provided to a State, the sum allocated to that State for technical assistance and energy conservation measures, including solar or other renewable resource measures shall be reduced by an equal amount. Such funds shall be reallocated among all other States on the same basis as the initial allocation. The Secretary may make such a grant if the State has demonstrated that—

(1) The State would otherwise be unable to participate in the program; and

(2) The amount of the additional financial assistance requested is the minimum necessary to allow the State to participate.

(c) Where a State has expended funds without financial assistance under this subpart for the conduct of preliminary energy audits or energy audits commenced on or after November 9, 1978, the Secretary may, upon application and approval under this subpart, accept all or any portion of such expenditures as constituting State matching funds.

(d) To the extent that funds allocated to a State for preliminary energy audits and energy audits are not needed because all potentially eligible buildings have had or will have an energy audit or its equivalent conducted, such funds may be made available for technical assistance or energy conservation measures. DOE shall, upon request by the State, redistribute funds not needed for preliminary energy audits and energy audits to the State allocation for technical assistance or energy conservation measures, as appropriate, and such funds shall be in addition to those which would otherwise be available for such purposes.

(e) Amounts made available from other than Federal sources shall come from State, local, or private sources and shall not be derived from revenue-sharing or any other Federal source, as determined by the Secretary.

§ 455.13 Allocation of funds.

(a) Financial assistance for conducting preliminary energy audits and energy audits of school facilities and hospital facilities shall be allocated among the States by multiplying the sum available by the allocation factor (F).

(b) Financial assistance for conducting preliminary energy audits and energy audits of buildings owned by units of local government and public care institutions shall be allocated among the States by multiplying the sum available by the allocation factor (F).

(c) The allocation factor (F) shall be determined by the formula—

$$F = \left(\frac{.1}{n}\right) + \left(\frac{.7\ SP}{NP}\right) + \left(\frac{.2\ SC}{NC}\right)$$

where, as determined by DOE—

(1) n is the total number of States;

(2) SP is the population of the State, as determined from 1976 census estimates, "Current Population Reports" Series p-25, number 642, or territory as determined from 1973 census estimates, "Current Population Reports", Series p-25, number 603;

(3) NP is 217,820,000, the total population of all States;

(4) SC is the sum of the State's heating and cooling degree days, as determined from National Oceanic and Atmospheric Administration data for the thirty year period, 1941 through 1970; and

(5) NC is 347,729, the sum of all States' heating and cooling degree days.

(d) Financial assistance allocated to a State pursuant to this subpart for a grant program cycle which remains unobligated at the end of the grant program cycle shall, if available, be reallocated under paragraphs (a) or (b) of this section, as appropriate, in the subsequent grant program cycle.

§ 455.14 Submission and review of applications.

(a) To be eligible to receive financial assistance, a State shall complete and submit an original copy of the application to the Secretary. Such application shall be signed by the Governor or his designee.

(b) The first State application shall be submitted not later than 30 days after the effective date of this subpart. Subsequent State applications shall be submitted for each grant program cycle on or before the date established by the Secretary for—

(1) Schools and hospitals;

(2) Buildings owned by units of local government and public care institutions; or

(3) Both.

(c) The State shall consult with representatives of schools, hospitals, units of local government and public care institutions during the preparation of applications for financial assistance for preliminary energy audits and energy audits.

(d) The Governor may request an extension of the submission date for a State's application by sending a written request to the Secretary prior to the date upon which it is due. An extension will only be provided for good cause shown. Such a request shall include a brief discussion of work remaining to be done on the application and time required for its completion. An extension shall not exceed 60 days except where additional time may be required by a State to enact enabling legislation, or where the Secretary finds an additional extension to be consistent with the overall objectives of the Act and the requirements of this subpart.

(e) The Secretary shall review each timely State application and provide financial assistance if the Secretary determines that the application meets the objectives of the Act and the requirements of this subpart.

(f) All or any portion of an application under this section may be disapproved to the extent that funds are not available under this subpart to carry out such application or portion thereof.

(g) The Secretary shall state in writing the reasons any application is disapproved. Applications not approved by the Secretary may be resubmitted by the applicant at any time within the grant program cycle in the same manner as the original application, and the secretary shall approve such resubmitted application if it is found to be in compliance with the requirements of this subpart. Amendments of an application shall, except as the secretary may otherwise provide, be subject to approval in the same manner as the original application.

§ 455.15 Content of applications.

(a) An application shall contain—

(1) The name and mailing address of the proposed State grantee;

(2) A budget which shall include identification of the sources, amounts, and intended use of non-Federal funds required to meet the cost-sharing provisions of section 455.12; and

(3) Assurance that audit procedures to be employed will meet the requirements of Subpart E of 10 CFR Part 450.

(b) For each program for which financial assistance is sought, a State application shall also contain—

(1) A timetable, including a listing of milestones for the activities to be carried out by calendar quarters for each program for which financial assistance will be provided;

(2) A description of materials to be developed and adopted, or an identification of existing materials to be used, to meet the requirements for conducting preliminary energy audits and energy audits set forth in Subpart E of 10 CFT Part 450, including provision of data concerning heating degree days, cooling degree days, insulation, and wind speed for regions within the State;

(3) A description of the training to be provided those persons who will conduct energy audits. Such training shall, at a minimum, use as instructors architects or engineers who have had practical experience in performing energy audits. The minimum qualifications of those attending the training course, and the minimum qualifications of those who will be permitted to perform energy audits

without having attended the training course, shall also be described.

(4) An explanation of how the size of the sample and the selection of sample buildings will be determined in those instances where a sampling methodology is used in the conduct of preliminary energy audits.

(5) A description of the method which will be used to advise eligible institutions of the availability of assistance under this subpart, and the amounts available by categories of institutions as determined under paragraphs (c)(3) and (d)(2) of this section.

(c) A State application for financial assistance to conduct preliminary energy audits and energy audits of school and hospital facilities shall contain—

(1) A description of the procedures the State will use to provide funding or services to those schools and hospitals which are willing and able to conduct their own energy audits;

(2) A justification for any funding applied for in excess of the 50 percent limit provided in paragraph (a) of § 455.12;

(3) A description of the method by which funds will be apportioned between school facilities and hospital facilities, including a justification for the apportionment if fewer than all such facilities will be audited;

(4) An explanation of the manner in which activities to be conducted shall be consistent with—

(i) Related State programs for educational facilities in such State; and

(ii) State health plans under Sections 1524(c)(2) (42 U.S.C. 300m–3; 88 Stat. 2247) and 1603 (42 U.S.C. 300o–2; 88 Stat. 2259) of the Public Health Service Act; and

(5) A description of the actions taken by the State to solicit and consider the views of representatives of schools and hospitals during the preparation of the State's application.

(d) A State application for financial assistance to conduct preliminary energy audits and energy audits of buildings owned by units of local government and public care institutions shall contain a description of—

(1) The procedures the State will use to provide funding or services to those units of local government and public care institutions which are willing and able to conduct their own energy audits.

(2) The method by which funds will be apportioned between buildings owned by units of local government and public care institutions including a justification for the apportionment if fewer than all these buildings will be audited; and

(3) The action taken by the State to solicit and consider the views of representatives of units of local government and public care institutions during the preparation of the State's application.

(e) A State application shall set forth procedures—

(1) By which buildings or complexes eligible for preliminary energy audits and energy audits will be identified, and a listing thereof prepared and maintained.

(2) For the State to participate, on a selective sampling basis, in the performance of on-site energy audits to assure that the findings present a reasonably thorough and accurate assessment of the buildings surveyed; and

(3) For the State to conduct follow-up visits, on a selective sampling basis, to ascertain the degree of implementation of energy audit results.

§ 455.16 Use of funds.

(a) A State shall either carry out preliminary energy audits and energy audits of schools and hospitals, or provide for the conduct of such audits by schools and hospitals, through use of funds which the State has received pursuant to paragraph (b) of § 455.11.

(b) A State shall either carry out preliminary energy audits and energy audits of buildings owned by units of local government and public care institutions, or provide for the conduct of such audits by units of local government and public care institutions, through the use of funds which the State has received pursuant to paragraph (c) of § 455.11.

(c) No financial assistance provided under this subpart shall be expended for—

(1) The audit of—

(i) A vacant, unused or condemned building;

(ii) A stadium which is part of a school facility used primarily for exhibitions for which admission is charged and which is not also generally used for intramural sports and physical fitness programs generally available to all students; or

(iii) A building or complex owned by a unit of local government or a public care institution—

(A) Not primarily occupied by such institution; or

(B) Which is intended for seasonal use; and

(2) The purchase or acquisition of any single piece of equipment or personal or personal property costing more than $300 to be used in conducting preliminary energy audits or energy audits, unless prior written approval has been obtained from DOE.

(d) Of the financial assistance privided to a State under this subpart, not more than 15 percent shall be expended for—

(1) Administrative expenses;

(2) Development of materials for the conduct of preliminary energy audits and energy audits;

(3) Training of personnel to conduct energy audits;

(4) For conducting preliminary energy audits and sample energy audits; and

(5) For monitoring and evaluation.

(e) At least 75 percent of the financial assistance provided under this part shall be used in conducting energy audits of buildings, including costs of personnel attending training sessions conducting by the State preparatory to performing energy audits.

§ 455.17 Reporting requirements.

(a) Each State receiving financial assistance under this part shall submit to DOE to a quarterly program performance report and a quarterly financial statement. The reports shall be submitted to DOE within 15 days following the end of each calendar quarter.

(b) The quarterly program performance report shall include—

(1) For those buildings which have received a preliminary energy audit or an energy audit, a summary of the categories, types of ownership, functional uses, gross square feet and energy use levels; and

(2) For those buildings which have received an energy audit—

(A) An estimae of the savings anticipated from energy conservaion operation and maintenance procedure changes identified; and

(B) An approximation of the energy savings indicated from applicable energy conservation measures if the procedure used by the State results in such information or a summary of the number of buildings for which the energy audit indicates potential for energy conservaion measures, including solar energy and renewable resource measures.

(c) The second quarterly report shall also include—

The total sum required for energy audits of buildings whose owners have been advised of selection to receive an energy audit;

(2) A copy of the materials adopted by the State for conducting energy audits;

(3) The apportionmant of funds pursuant to subparagraphs (c)(3) and (d)(2) of § 455.15 and the data on which such apportionment was based;

(4) The listing of institutions and their buildings compiled pursuant to the provisions of paragraph (e)(1) § 455.15, summarized by category, types of ownership, and functional use;

(5) Any necessary revisions to the estimate of the characteristics and energy conservation potential of buildings owned by eligible insititutions resulting from the sample preliminary energy audits, if a sampling approach was used.

(d) Copies of preliminary energy audit and energy audit reports made by or furnished to the State under § 450.45 of 10 CFR Part 450 shall be submitted to DOE together with the quarterly report.

(e) Reports shall contain such other information as may be required by DOE.

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Part II

Department of Energy

Technical Assistance and Energy Conservation Measures: Grant Programs for Schools and Hospitals and for Buildings Owned by Units of Local Government and Public Care Institutions

DEPARTMENT OF ENERGY

10 CFR Part 455

Technical Assistance and Energy Conservation Measures: Grant Programs for Schools and Hospitals and for Buildings Owned by Units of Local Government and Public Care Institutions

AGENCY: Department of Energy.

ACTION: Final rule.

SUMMARY: The Department of Energy (DOE) is issuing a final regulation for cost sharing grant programs to reduce the energy use and anticipated energy costs for (1) schools and hospitals and (2) buildings owned by units of local government and public care institutions. These objectives are to be achieved by providing financial assistance for identifying energy conservation maintenance and operating procedures; conducting technical assistance programs to identify and evaluate attainable energy conservation objectives; and, for schools and hospitals, acquiring and installing energy conservation measures, including solar and other renewable resource measures. This is the second and final segment of DOE regulations for implementation of programs established pursuant to Title III of the National Energy Conservation Policy Act (NECPA), Pub. L. 95-619, 92 Stat. 3206. The first portion of the programs provides financial assistance for the conduct of preliminary energy audits and energy audits for schools, hospitals, units of local government and public care institutions pursuant to regulations published in the Federal Register on April 2, 1979 (44 FR 19340). Participation in both phases of the programs is voluntary. The Secretary may make grants to schools, hospitals, units of local government and public care institutions for technical assistance programs; to schools and hospitals for energy conservation measures, including solar and other renewable resource measures; and to States for defraying administrative costs.

DATES: This regulation is effective April 17, 1979. States must submit State Plans to the Secretary on or before August 15, 1979. The first grant program cycle for technical assistance and energy conservation measures, including solar and other renewable resource measures, will begin on April 17, 1979 and will end on February 1, 1980.

FOR FURTHER INFORMATION CONTACT:

Michael Willingham, or Ronald Milner, Institutional Buildings Grants Programs Division, Office of Conservation and Solar Applications, Room 4117, 20 Massachusetts Avenue, N.W., Washington, D.C. 20545 (202) 376-4149.

Lewis W. Shollenberger, Jr., or Dennis M. Moore, Office of the General Counsel, Department of Energy, Room 3224, 20 Massachusetts Avenue, N.W., Washington, D.C. 20545 (202) 376-4011.

Mark Friedrichs, Office of Policy and Evaluation, Department of Energy, Room 5316, 1200 Pennsylvania Avenue, N.W., Washington, D.C. 20461 (202) 633-8595.

SUPPLEMENTARY INFORMATION:

I. Introduction
II. Elements of the Program
III. Notice of Grant Program Cycle
IV. Discussion of Major Comments and Revisions
V. Additional Information

I. Introduction

With the issuance of this final regulation, the Department of Energy (DOE) amends Chapter II of Title 10, Code of Federal Regulations, by adding Subparts C through I to Part 455. This regulation fulfills the remaining requirements of Title III of the National Energy Conservation Policy Act (NECPA), Pub. L. 95-619, 92 Stat. 3206, which amended Title III of the Energy Policy and Conservation Act (EPCA), Pub. L. 94-163, 89 Stat. 871, by adding Parts G and H, to establish cost sharing energy conservation grant programs to fund technical assistance programs for schools, hospitals, buildings owned by units of local government and public care institutions, and to fund the acquisition and installation of energy conservation measures, including solar and other renewable resource measures, for schools and hospitals.

On January 5, 1979, DOE published a proposed regulation which described this grant progam and solicited comments from interested persons (44 FR 1560). DOE received and considered 324 written comments and the testimony of 54 persons presented at hearings held in Washington, D.C.; Chicago, Illinois; and Seattle, Washington, on January 22-24, 1979. Summaries of the major comments received, a number of which resulted in changes to the final rule, are discussed below.

On April 2, 1979, DOE published a final regulation implementing the first portion of the energy conservation grant programs established under Title III of NECPA (44 FR 19340). The first portion of these programs will provide financial assistance for the conduct of preliminary energy audits and energy audits to identify buildings suitable for further energy conservation analysis, to identify maintenance and operating changes which could save energy, and to estimate the State-wide need and potential for conserving energy in eligible institutions.

This second portion of the energy conservation grant programs authorized by Title III of NECPA provides financial assistance for schools, hospitals, units of local government and public care institutions and coordinating agencies for conducting technical assistance programs to identify energy and cost savings likely to be realized as a result of modifying maintenance and operating procedures in a building and as a result of implementing energy conservation measures, including solar and other renewable resource measures, in a building. This regulation also provides financial assistance for schools and hospitals and coordinating agencies to acquire and install energy conservation measures to reduce energy consumption or to allow the use of alternative energy sources.

II. Elements of the Program

Initially, a State must formulate a State Plan for the operation of these grant programs and have the State Plan approved by DOE. Upon approval of the State Plan, a State energy agency will receive, review and rank applications for financial assistance for eligible schools, hospitals, units of local government and public care institutions. Applicants must prepare and forward their applications to the State in accordance with this regulation and the approved State Plan. If applications are determined by the State to be eligible for assistance under this regulation and the State Plan, the State will rank all buildings covered by those applications in order of priority for funding. The State will then forward to DOE once each grant program cycle all eligible applications together with its rankings of the buildings covered by those applications. Among other things, the State will also identify those buildings proposed by the State for grant funding, based on the priority ranking, and set forth the funding, by building, recommended for each applicant.

Upon approval of State recommendations, DOE will make grant awards to applicants for up to 50 percent of the cost of a technical assistance program or energy conservation measure. In addition, DOE may make grant awards in excess of 50 percent of total costs to schools or

hospitals in a class of severe hardship in amounts recommended by the State in accordance with its State Plan for up to 90 percent of the cost of a technical assistance program or energy conservation measure. The total amount of all such hardship funding in a State may not exceed 10 percent of funds allocated to that State in a grant program cycle.

A State may also receive grants in amounts not exceeding 5 percent of all grants made in a State during a given grant program cycle for the purposes of defraying the costs of administering technical assistance programs and energy conservation measures grants.

III. Notice of Grant Program Cycle

DOE has elected to use "grant program cycles" for all NECPA Title III grant programs. For purposes of making grants for technical assistance programs and energy conservation measures, including solar and other renewable resource measures, the first grant program cycle begins on the date of publication of this regulation. State Plans under this regulation are due 120 days from the beginning of the cycle. For fiscal year 1978, NECPA authorizes appropriations in the amount of $180 million for schools and hospitals and $17.5 million for units of local government and public care institutions. Subject to the availability of these monies, Table 5 presents the amounts allocated to States for the first grant program cycle. Except as may otherwise be specified by the Secretary, this first grant program cycle for technical assistance and energy conservation measures shall end February 1, 1980.

IV. Discussion of Major Comments and Revisions

State Plan Submissions

Sections 394(a) and 400D(a) of EPCA direct the Secretary to invite State energy agencies of each State to submit State plans to DOE within 90 days after the effective date of this regulation. However, the law also permits the establishment of a longer period of time for this purpose if there is "good cause" for such action. Because the final regulation for preliminary energy audits and energy audits has been so recently issued, and since the development of State Plans in great measure depends on the results of the preliminary energy audits conducted in accordance with those final regulations, there is good cause for extending the time in which State Plans may be submitted to DOE. Accordingly, § 455.91 has been revised to permit 120 days, rather than the 90 days proposed, for their submission. This extension should permit States to conduct a sufficient number of preliminary energy audits to insure complete and comprehensive State energy planning.

Eligible Institutions and Buildings

Several comments addressed the range of institutions that may be eligible to receive grant funding. The definitions that determine which institutions are eligible for Federal grant funds are set forth in 10 CFR 455.2. States, as a result of their licensing and oversight authorities with respect to such institutions, are in the best position to apply those definitions to institutions within their jurisdictions when they review and evaluate grant applications.

Comments also addressed the range of buildings that may be eligible for Federal financial assistance. Buildings covered by applications from eligible institutions that house resources for the arts, humanities and for historic preservation (such as libraries, arts centers, etc.) in connection with schools, hospitals, units of local government and public care institutions may be eligible for financial assistance if such buildings conform to the requirements of Part 455. Although buildings owned by local educational agencies and used primarily as administrative buildings are eligible for preliminary energy audit and energy audit funding, such administrative buildings are not eligible for grants for technical assistance programs or energy conservation measures.

Energy Conservation Maintenance and Operating Procedures

An important element of these grants programs is the identification of energy conservation maintenance and operating procedures which require no significant expenditure of funds. The implementation of such procedures, once identified by an energy audit or technical assistance program, should result in substantial energy savings. Therefore, as a prerequisite to further participation in this program, the proposed regulation required applicants to implement all identified energy conservation maintenance and operating procedures prior to submitting a grant application for a technical assistance program or energy conservation measure.

This requirement has been modified in the final regulation to permit applicants to be eligible for technical assistance program or energy conservation measure grants without having implemented all energy conservation maintenance and operating procedures if satisfactory written justification for not implementing any such procedure is provided. Such justification will be considered satisfactory if it demonstrates that implementation of a maintenance and operating procedure recommended by an energy audit report or technical assistance report would violate an applicable health or safety code, would require special training for maintenance or operating personnel which cannot be completed prior to submitting a grant application, or would create other such overriding circumstances that make implementation impractical.

Technical Assistance Analyst Qualifications

NECPA directs that DOE establish factors which may be used by a State in prescribing criteria for identifying persons qualified to conduct technical assistance programs. It is essential that only those individuals possessing the relevant background, training and experience be considered as qualified technical assistance analysts. Therefore the proposed regulation required as a minimum that technical assistance analysts have experience in energy conservation and be registered professional engineers or architect-engineer teams. Numerous comments were received regarding these qualification factors. Among other things, it was suggested that the qualifications were overly restrictive and that they excluded certain groups from participating in the technical assistance phase of the program. Others suggested that States should be responsible for establishing programs for qualifying technical assistance analysts. A number of comments stated that many architects and architectural firms have the necessary experience to perform technical assistance programs, and suggested that architects be permitted to conduct a technical assistance program independently.

It is the intent of this regulation to establish minimum qualifications for technical assistance analysts to insure that participating institutions select individuals or firms able to perform the very complex and detailed technical assistance program. Accordingly, the final regulation specifies that the technical assistance analyst should be a registered professional engineer or, ideally, an architect and an engineer working as a team. However, the final regulation has been modified to permit a State to specify such alternative qualifications as it may deem appropriate and as are included in its approved State Plan. Such alternative

qualifications must insure that the technical assistance analyst has sufficient experience and training to perform all of the minimum requirements of a technical assistance program.

An architect-engineer team provides an especially suitable combination of professional skills to perform the comprehensive analysis of the building or buildings required for a technical assistance program. Several comments raised questions concerning the effect of the minimum requirements for technical assistance analysts and the contractual relationship between architectural firms and engineering firms which desire to perform jointly technical assistance programs. No prior relationship is required nor was it DOE's intent to preclude either member of the team, individually, from functioning as the prime contractor for a technical assistance program.

Several comments pointed out that the provision which requires that technical assistance analysts be free from conflicting financial interests may prevent technical assistance analysts from performing the detailed design functions which may be necessary under the energy conservation measures phase of these programs. This provision is intended to exclude those individuals having a financial interest in the products or equipment acquired and installed under an energy conservation measures grant. A State must establish procedures, as a part of its State Plan, to implement these requirements. These procedures must also exclude any other individuals having financial interests which conflict with the proper performance of their duties. This requirement should not be construed to preclude technical assistance analysts from performing detailed design or inspection services under the energy conservation measures phase of these programs.

Technical Assistance Procedures

It is essential that a technical assistance program consist of a thorough survey and analysis of both the building envelope and the building's energy-using systems. A few comments suggested that thermographic inspections of the building be required as part of a technical assistance program. While such methods are a valuable tool in analyzing a building, the final regulation does not specify any methods to be utilized as part of a technical assistance program. It is left to the discretion of the technical assistance analyst to select the methods which, in the analyst's judgment, are the most appropriate for the building which is being analyzed.

Eligible Energy Conservation Measures

Several comments suggested that DOE expand the grant programs for schools and hospitals to fund experimental energy conservation measures. A list of previously demonstrated energy conservation measures, including solar and other renewable resource measures, is set forth in § 455.52. Solar measures eligible for funding include both active and passive solar energy systems, as well as other renewable resource measures. This list is not all inclusive. Other measures identified in a technical assistance program or an energy audit performed pursuant to Subpart C of 10 CFR Part 450, which have an average simple payback of more than 1 year and less than 15 years, may be included in any grant application. A complete description of such measures must accompany the application. The description must include calculations and other technical data which indicate the projected cost and energy savings of such measures. An experimental energy conservation measure for which an applicant cannot adequately project costs and energy savings will not be considered for funding.

Consideration of Solar and Other Renewable Resource Measures

In view of comments received, and due to the desirability of increased utilization of solar energy to reduce consumption of non-renewable energy resources, the final regulation reflects greater emphasis on conversions to solar and other renewable resource systems, where appropriate. Specifically, certain basic data regarding a building's potential for solar applications will be collected during the preliminary energy audit and energy audit phase of the program. Upon analysis of preliminary energy audit data, the State should be able to specify in its State Plan the extent to which, and by which methods, utilization of solar systems will be encouraged within that State. Each technical assistance program must include an evaluation of the building's potential for solar conversion and an identification of any known zoning ordinances and building codes which may place restrictions on or barriers to the installation of solar energy systems. It is intended that, initially, the technical assistance analyst will evaluate the data collected during the preliminary energy audit and energy audit phase of the program. If, upon completion of this initial evaluation, it is determined that the building has potential for conversion to solar or other renewable resource measures, the technical assistance analyst will undertake a more detailed analysis of the costs and energy cost savings associated with the acquisition and installation of such measures.

Leased Equipment

Several comments suggested that the installation and use of equipment which is normally leased, such as computer control systems, qualify as an eligible energy conservation measure. The final regulation has been changed to permit grants for the costs of installing and connecting leased equipment, such as a computer-operated energy monitoring or control system. However, the recurring lease costs associated with leased equipment, which typically include maintenance and service costs, are not eligible for funding. To calculate the simple payback period for leased equipment, the procedure set forth in § 455.52(w) shall be used. This procedure is required to insure that recurring lease costs are considered in the overall evaluation of such a proposed measure.

Starting Date for Eligible Programs and Measures

Several comments requested a change in a provision of the proposed regulation to permit the funding of technical assistance programs and energy conservation measures, including solar and other renewable resource measures, begun prior to November 9, 1978. The conference committee report accompanying NECPA indicates that project costs incurred prior to November 9, 1978 are not to be considered eligible for grant funding. Accordingly, this suggestion has not been adopted. However, expenditures for a technical assistance program commenced on or after November 9, 1978, may be wholly or partially classified by the Secretary as non-Federal funds for the purposes of matching a grant for the acquisition and installation of energy conservation measures identified by such technical assistance program.

Applicant's Submissions to States

A number of comments raised questions concerning the manner in which institutions are to file applications for technical assistance program grants and energy conservation measures grants. The requirements governing applications for grant funds are contained in Subpart E of Part 455 and have been modified only slightly from their proposed form. Since applicants must forward grant

applications to a State for review, evaluation and ranking, applicants may also be required to submit their grant applications in conformity with any additional procedures or requirements prescribed by the State in the State Plan. This regulation, however, does not prohibit two or more institutions from submitting a single application to the State. Indeed, DOE encourages States to permit institutions to apply for grant funds through a coordinating agency (such as the State, a State hospital or school facilities agency, or a regional or district organization representing schools or hospitals) which could act as an agent for institutions whose buildings are covered by the coordinating agency's application. The use of coordinating agencies may: (1) Reduce the administrative workload for institutions, (2) introduce economies of scale for applicants, (3) allow institutions, which might otherwise lack the expertise or resources, to participate, and (4) expedite the processing of applications and the administration of the program.

State Evaluation and Ranking of Grant Applications

The State evaluation and ranking requirements set forth in §§ 455.70 and 455.71 elicited a number of comments and requests for clarification. These provisions have been revised primarily to incorporate several suggested changes to the ranking criteria and to clarify the procedure to be used for ranking applications for technical assistance programs and energy conservation measures.

The evaluation and ranking process prescribed by Subpart F requires the State to make two determinations. First, a State will review and evaluate an application to determine whether the applicant is eligible for financial assistance and thus a candidate for inclusion in the State's ranking process. Eligible applicants must conform to all of the requirements of Subparts C, D and E of Part 455, the requirements of the approved State Plan, any State environmental laws, and any other applicable laws or regulations. Applications of schools and hospitals must receive certifications from the State school or hospital facilities agency, as the case may be, in order to be eligible for Federal assistance. This certification process will take place concurrently with the State's evaluation and ranking in a manner such that no unnecessary delay results. An applicant that does not conform to these requirements or that fails to receive certification is not eligible for Federal assistance and its application should be returned immediately to it, together with an explanation of the application's deficiencies.

Second, a State will rank buildings for which an eligible applicant has requested financial assistance to determine, in accordance with the criteria established in its State Plan, which buildings should be recommended for up to 50 percent funding. Although a few comments recommended that States rank metered facilities rather than buildings, DOE has retained the more refined requirement of a building-by-building ranking, since estimated energy consumption for individual buildings can be calculated using standard engineering procedures.

Section 455.71(a) establishes detailed criteria for ranking buildings for technical assistance programs. Buildings will be ranked on the basis of energy conservation potential as indicated by energy audits of those buildings and in accordance with the methods prescribed by the State Plan. Preference will be given to buildings for which an energy audit was completed without the use of Federal funds in the case of buildings having equivalent energy conservation potential

The ranking criteria applicable to energy conservation measures set forth in § 455.71(b) have been modified only slightly to reflect, among other things, a preference for savings of oil over savings of natural gas. Weights for each prescribed criterion will be assigned by the State.

The product of the State ranking process for technical assistance programs and energy conservation measures will be three lists of buildings ranked in order of descending priority based upon the criteria prescribed by § 455.71. There will be a separate list of buildings for technical assistance programs for units of local government and public care institutions, for technical assistance programs for schools and hospitals, and for energy conservation measures for schools and hospitals.

At the request of an applicant for an energy conservation measure grant, a group of buildings may be ranked as a single building if the application requests funding for the acquisition and installation of a single energy conservation measure which directly involves all of the buildings. This permits applicants the option to seek funding for measures that affect more than one building. In such cases, an applicant will submit the average simple payback of the single measure proposed for all of the buildings affected by that measure as well as averaged data for all the buildings for the other ranking criteria. States will rank the buildings covered by such an application based upon those averages.

Within each list, a State will indicate the ranking and the amount of financial assistance requested for each eligible building. The State will also indicate the amount of funding recommended by the State for each building. Where the amount recommended for any building by the State is less than the amount requested by the applicant, the State shall also indicate the reason for such recommendation. Those buildings ranking highest on the list will receive financial assistance within the amount of funds allocated for each State for grants up to 50 percent of eligible costs.

The State will perform two additional reviews of each list of school and hospital buildings. First, the State must assure that neither schools nor hospitals are recommended for more than 70 percent of the total funds allocated for technical assistance programs and energy conservation measures.

Second, the State must evaluate school and hospital buildings for which "severe hardship" claims have been made. With respect to those school and hospital applications requesting such funding, only those applications which would otherwise qualify for grants up to 50 percent may be considered by the State. For such qualified applications, the State must perform a separate evaluation of the relative need of each applicant. The evaluation must be performed in accordance with the procedures established by the State in its State Plan in accordance with the criteria set forth in § 455.72(d)(2). The results of this evaluation will determine the amount of additional Federal funding, in excess of 50 percent, for which each applicant is qualified. After this evaluation has been completed, buildings in a class of severe hardship shall be recommended for funding in descending order of their energy saving potential, determined pursuant to §§ 455.71 (a) and (b). These results will be recorded within each list for schools and hospitals by indicating: (1) The amount of additional hardship funding requested for each building by each application qualified for hardship funding; and (2) the amount of hardship funding recommended by the State based upon relative need, as determined in accordance with its State Plan, to the limit of the hardship funds available.

Requests for hardship funding, as determined by the State and indicated in the State ranking, will be approved by DOE to the extent that the total of all

such requests for hardship funding does not exceed 10 percent of the total allocation of funds to the State for schools and hospitals in the applicable grant programs cycle.

Prior to forwarding applications to the Secretary, each State must certify that each institution recommended for funding in any amount has given its assurance that it is willing and able to participate in the program based on the amounts recommended by the State and set forth in the State's ranking of all applications pursuant to § 455.71.

It is anticipated that in some cases the amounts requested by eligible applicants will be less than the total amount allocated to the State in a particular grant program cycle. In such cases, the State is exempt from the ranking requirements of § 455.71. With respect to eligible applications for schools and hospitals, the State is exempt from the ranking requirements only if the total amount requested for grants up to 50 percent is less than or equal to the funds available for such grants and the total amount recommended for hardship funding is less than or equal to the amount reserved by the State for that purpose. Unobligated funds remaining at the close of a grant program cycle will be reallocated, if available, to all States in the succeeding grant program cycle.

Economic Analysis Ranking Factor

NECPA requires that DOE establish criteria for ranking applications for energy conservation measures, including solar and other renewable resource measures. The primary ranking factor selected for this phase of the program is the measure's cost-effectiveness. The proposed regulation specified a simple payback methodology for this ranking factor. A number of comments were received regarding the use of this methodology. Most of the comments indicated that simple payback is not as accurate in determining the cost-effectiveness of a measure as is life-cycle costing. A life-cycle costing methodology considers the time value of money, fuel price escalations and future operating, maintenance and other costs over the life of the building or measure. The use of discounted payback was also suggested. Because simple payback provides only an approximate indication of actual cost-effectiveness, DOE has undertaken the development of a life-cycle costing methodology which it currently plans to adopt for evaluating energy conservation measures under this program. However, this methodology will not be available for use during the first grant program cycle. Therefore, the regulation specifies the use of the simple payback methodology, but encourages institutions to obtain a life-cycle cost analysis for use in their decision-making process for the first grant program cycle.

Several comments were also received regarding the 15-year simple payback period limitation on energy conservation measures, including solar and other renewable resource measures. Comments were approximately balanced between those favoring a shorter payback period limitation and those favoring a longer payback period limitation. Other comments suggested that States be responsible for determining the limitation. No change has been made to the final regulation. The 15-year simple payback limitation on eligible measures approximates the limit that would result if measures were determined to be cost-effective by a life-cycle cost analysis (assuming a 10-percent real discount rate, current fuel price forecasts and a 25-year useful life of the measure or building). Since DOE intends to amend this regulation to substitute life-cycle cost analysis for simple payback, this provision may be deleted at that time.

State Forwarding of Grant Applications

A number of comments suggested changes to the requirement of § 455.72 that States forward grant applications to DOE only once each grant program cycle. Some comments proposed to permit States to forward applications for financial assistance continuously or at several times during the grant program cycle to reduce administrative burdens which might delay the attainment of energy savings. Since NECPA specifically limits the frequency of application submittals, this provision has not been altered. Further, this single submittal is likely to result in a more equitable allocation of the available funds by requiring the simultaneous evaluation of all applications received during a single grant program cycle.

Grant Awards

Several comments requested that the regulations clarify whether additional funding will be available to an applicant in the same or a subsequent grant program cycle to complete a technical assistance program or energy conservation measure that has already been funded by a grant. Section 455.80 has been amended to specify that no additional assistance will be available to fund cost overruns. In order to promote accurate cost calculation and thereby assure that only cost-effective technical assistance programs and energy conservation measures, including solar or other renewable resource measures, receive Federal assistance, DOE shall award only one grant for any technical assistance program or energy conservation measure for any building.

State Administrative Costs

The subject of grant awards to defray State expenses incurred in administration of this program elicited numerous comments from States and institutions. Several comments favored the proposed provision allowing 50 percent matching grants to States in amounts not exceeding 5 percent of all grants awarded to institutions within a State. Some comments, however, suggested awarding such grants as early as possible in the grant program cycle to help cover the significant expenditures required for a State to develop a State Plan and to establish its system for accepting and reviewing grant applications before they are submitted to DOE. It was also suggested that DOE raise the allowable percentage of funding for the States.

DOE still anticipates that 5 percent of the grants awarded within a State will provide the State with adequate funding, when coupled with State matching funds, to administer effectively this phase of the program. However, §§ 455.82 and 455.83 have been revised to permit earlier grant awards for this purpose. As revised, a State may apply for an administrative expense grant concurrently with submission of its State Plan. For subsequent grant program cycles, a State may apply for an administrative expense grant immediately upon publication by DOE of the amounts allocated for among the States for that grant program cycle. Up to 2 percent of the amounts allocated to the State for grants for technical assistance programs and energy conservation measures will be available for administrative expense grants. For the first grant program cycle, DOE plans to award these 2 percent grants for State administrative costs at the time the State Plan is approved.

Subsequent to this initial application for administrative costs, States may forward a second application to DOE during each grant program cycle at the time the State forwards all the grant applications eligible for technical assistance programs and energy conservation measures. At that time, States may apply for an administrative expense grant up to an amount equal to the difference between the initial amount awarded for an administrative expense grant for that grant program cycle and 5 percent of the total of all

grants recommended for institutions in that State in the same grant program cycle. All grants for State administrative expenses are subject to the 50 percent matching requirements. The total of all amounts requested to defray State administrative expenses plus the total of all amounts recommended to fund technical assistance programs and energy conservation measures must be less than or equal to the total amount allocated for the State.

The limitations on State administrative expenses set forth in § 455.83 were also revised pursuant to comments received. States' expenses may now include the acquisition of services, such as computer, printing or other services, directly supporting the State's administration of the grant program. In addition, the cost limit on any single item of equipment acquired was raised from $200 to $300. Items costing in excess of $300 may only be purchased with the express consent of the Secretary.

Allocation Formula

The formula established for allocating funds among the States for schools and hospitals and for units of local government and public care institutions is designed to reflect the relative need for financial assistance of each State. The population and climate of each State is considered to be the best indicator of need, because these two factors tend to reflect the number of buildings eligible for assistance and the level of energy use within such buildings, respectively. Total energy use of the eligible institutions within any State is expected to be approximately in direct proportion to the product of these factors. Bureau of Census estimates were used as the basis for all population data. Population-weighted State averages for heating and cooling degree days, as determined by the National Oceanic and Atmospheric Administration, were used to indicate climate. Although heating and cooling degree days do not precisely reflect the different energy requirements of buildings, they are the only indicators of climate currently available on a population-weighted basis for all States. DOE is examining possible alternatives to the use of heating and cooling degree days in response to comments concerning the formula. These alternatives will not be available for use in computing State allocations during the first grant program cycle. If an alternative measure of climate is developed which more precisely reflects actual energy use and the potential for energy conservation, the allocation formula established by these rules will be appropriately amended at that time.

Fuel cost is used in the allocation formula to reflect the special needs of those regions where the price of energy is somewhat higher than the national average. And, finally, a portion of the available funds is allocated equally among all States in order to reflect the minimum requirements necessary to participate in the program and to assure that no State (except the District of Columbia and the eligible territories) receive less than 0.5 percent of the total amounts appropriated, as required by section 396 of EPCA.

A number of comments stated that the formula for allocating funds among States was incorrect and that the allocation factors given in Table 4 of the proposed regulation could not be derived with the data and formula given. The regulations have been changed to clarify the factors in the allocation formula. The denominator of the fuel cost factor is the summation of the fuel cost numerators of all States. The denominator of the population-climate factor is the summation of the population-climate numerators of all States. In addition, there were several errors in the climate data given in Table 3 of the proposed regulation. The correct data for fuel cost, population and climate are set forth below in Tables 1, 2 and 3, respectively. New allocation factors appear in Table 4, and the allocation of funds among States for local government and public care buildings and for schools and hospitals for the first grant program cycle are given in Table 5.

Table 1.—*Oil Import Price: 15.32*

[Demand Region Average Retail Price Summary in 1978 $/Million Btu's]

Sector (fuel)	Demand regions									
	New-Eng.	N.Y./N.J.	Mid-Atl.	S.-Atl.	Midwest	S.-West	Central	N.-Cntrl.	West	N.-West	Total
Residential	5.11	5.66	5.14	7.87	4.98	5.20	4.41	4.10	5.59	4.82	5.39
(Elect.)	13.31	15.91	13.69	11.05	12.00	11.87	12.70	9.66	12.66	5.83	11.71
(Dist.)	3.89	3.97	4.16	4.23	3.79	3.90	3.66	3.87	3.86	3.85	3.95
(LG)	3.90	4.01	4.23	4.32	3.99	3.91	3.91	4.07	3.94	3.94	4.04
(Coal)	2.07	1.95	1.84	1.97	1.75	1.83	1.99	1.37	1.75	1.76	1.82
(NG)	4.52	4.15	3.66	3.15	3.11	2.39	2.11	2.26	3.35	3.65	3.09
Commercial	4.78	6.45	6.46	6.85	5.15	6.02	6.06	5.26	6.86	4.22	5.96
(Elect.)	13.22	17.66	13.31	11.19	11.96	11.26	12.43	8.80	11.71	5.81	12.01
(Dist.)	3.64	3.71	3.76	3.76	3.60	3.64	3.51	3.64	3.66	3.56	3.66
(Resid.)	2.87	2.86	3.27	2.60	3.12	2.87	3.10	3.01	2.82	2.85	2.90
(LG)	3.27	3.27	3.27	3.27	3.49	3.27	3.46	3.47	3.27	3.27	3.36
(Coal)	2.07	1.95	1.84	1.97	1.75	1.83	1.99	1.37	1.75	1.76	1.82
(Asphalt)	3.18	3.18	3.18	3.17	3.20	3.13	3.15	3.19	3.07	3.07	3.15
(NG)	3.66	3.53	3.11	2.63	2.78	2.46	3.48	3.13	2.83	3.05	2.94
Raw material [1]	3.43	3.36	3.18	2.62	3.25	3.27	3.28	3.20	3.08	2.92	3.22
(LG)	3.61	3.61	3.61	3.58	3.58	3.54	3.52	3.56	3.44	3.44	3.54
(Oil)	3.18	3.18	3.18	3.17	3.20	3.13	3.15	3.19	3.07	3.07	3.15
(NG)	3.29	2.83	2.69	2.19	2.44	2.16	3.10	2.65	2.44	2.37	2.53
Industrial [2]	4.96	4.54	3.62	4.99	3.88	2.98	4.79	3.16	3.85	3.26	3.79
(Elect.)	10.97	9.47	10.97	9.40	9.37	9.57	10.55	7.30	9.96	9.86	9.29
(Dist.)	3.64	3.88	3.88	3.85	3.80	3.83	3.50	3.86	3.56	3.56	3.67
(Resid.)	2.92	3.06	3.19	2.87	3.10	2.96	3.07	2.96	2.82	2.97	2.99
(LG)	3.66	3.74	3.95	3.99	3.82	3.70	3.76	3.85	3.69	3.69	3.79
(Coal)	2.07	1.95	1.84	1.97	1.75	1.83	1.99	1.37	1.75	1.76	1.76
(Met Coal [3])	2.18	2.08	1.97	2.10	2.02	2.12	1.95	2.21	2.59	2.70	2.03
(Naphtha)	3.61	3.61	3.61	3.58	3.58	3.54	3.52	3.56	3.44	3.44	3.56
(NG)	3.29	2.83	2.69	2.34	2.44	2.16	3.10	2.65	2.44	2.37	2.31
Transportation	5.74	5.79	5.67	5.63	5.67	5.22	5.52	5.49	5.38	5.42	5.55
(Elect.)	12.44	14.25	12.36	10.33	10.61	10.64	11.74	8.59	11.37	4.96	13.22
(Dist.)	4.79	4.84	5.00	4.89	4.78	4.77	4.85	4.82	4.71	4.71	4.82
(Resid.)	2.92	3.06	3.19	2.87	3.10	2.96	3.07	2.96	2.82	2.97	2.99
(LG)	3.27	3.27	3.27	3.27	3.49	3.27	3.46	3.47	3.27	3.27	3.31
(Gasoline)	6.05	6.27	6.03	5.94	6.06	5.73	5.83	5.87	6.01	6.02	5.96
(Jet Fuel)	4.12	4.23	4.49	4.54	4.05	4.16	3.93	4.16	4.10	4.10	4.22
Average price	5.16	5.62	5.08	5.76	4.67	3.83	5.01	4.40	5.11	4.42	4.82

[1] Liquid gas in the raw material sector includes liquid gas feedstock.
[2] Met Coal includes 70% premium coal and 30% bituminous low sulfur coal.
[3] Industrial sector here does not include refineries.

Source: Energy Information Administration. Prepared for the Administrator's Annual Report, 1977 (1985 Series C projections).

Table 2

State	Population (in thousands)
Alabama	3,666
Alaska	302
Arizona	2,270
Arkansas	2,109
California	21,520
Colorado	2,889
Connecticut	3,117
Delaware	582
Dist. of Columbia	702
Florida	8,421
Georgia	4,970
Hawaii	887
Idaho	831
Illinois	11,239
Indiana	5,322
Iowa	2,870
Kansas	2,310
Kentucky	3,438
Louisiana	3,841
Maine	1,070
Maryland	4,144
Massachusetts	5,899
Michigan	9,104
Minnesota	3,986
Mississippi	2,364
Missouri	4,775
Montana	750
Nebraska	1,553
Nevada	810
New Hampshire	922
New Jersey	7,336
New Mexico	1,166
New York	18,084
North Carolina	5,469
North Dakota	643
Ohio	10,660
Oklahoma	2,766
Oregon	2,329
Pennsylvania	11,862
Rhode Island	927
South Carolina	2,949
South Dakota	666
Tennessee	4,214
Texas	12,487
Utah	1,238
Vermont	476
Virginia	5,032
Washington	3,612
West Virginia	1,821
Wisconsin	4,606
Wyoming	390
American Samoa	30
Guam	105
Puerto Rico	2,661
Virgin Islands	93
U.S. total	217,820

Table 3

State	Heating degree days	Cooling degree days
Alabama	2,695	1,969
Alaska	12,012	0
Arizona	2,289	2,624
Arkansas	3,214	1,982
California	2,726	999
Colorado	7,004	326
Connecticut	6,130	507
Delaware	4,750	1,021
Dist. of Columbia	4,750	1,415
Florida	704	3,369
Georgia	2,964	1,859
Hawaii	0	3,539
Idaho	6,917	415
Illinois	6,088	950
Indiana	6,713	952
Iowa	6,934	879
Kansas	4,900	1,543
Kentucky	4,414	1,254
Louisiana	1,701	2,636
Maine	8,902	222
Maryland	4,782	1,015
Massachusetts	6,228	467
Michigan	6,730	585
Minnesota	8,729	473
Mississippi	2,411	2,233
Missouri	5,004	1,332
Montana	8,802	339
Nebraska	6,347	1,250
Nevada	4,576	1,500
New Hampshire	7,598	397
New Jersey	5,476	577
New Mexico	4,766	572
New York	6,999	577
North Carolina	3,392	1,464
North Dakota	8,464	421
Ohio	5,779	797
Oklahoma	3,508	2,508
Oregon	5,354	193
Pennsylvania	5,756	723
Rhode Island	5,994	448
South Carolina	2,697	1,288
South Dakota	7,861	601
Tennessee	3,801	1,409
Texas	2,016	2,999
Utah	5,990	930
Vermont	7,973	299
Virginia	4,396	1,113
Washington	5,792	171
West Virginia	5,109	849
Wisconsin	7,831	541
Wyoming	7,995	328
American Samoa	0	5,335
Guam	0	5,011
Puerto Rico	0	4,907
Virgin Islands	0	
		5,427
U.S. Total	270,449	77,290

Table 4

State	0.67/n + 0.1(Shc)/Nhc + 0.83(SP)(SC)/(NPC) = Allocation Factor			
Alabama	.0013	.0021	.0112	.0146
Alaska	.0013	.0016	.0030	.0059
Arizona	.0013	.0019	.0073	.0104
Arkansas	.0013	.0014	.0070	.0097
California	.0013	.0019	.0478	.0507
Colorado	.0013	.0016	.0122	.0152
Connecticut	.0013	.0019	.0136	.0168
Delaware	.0013	.0019	.0022	.0053
Dist. of Columbia	.0013	.0019	.0038	.0070
Florida	.0013	.0021	.0223	.0257
Georgia	.0013	.0021	.0147	.0181
Hawaii	.0013	.0019	.0039	.0052
Idaho	.0013	.0016	.0040	.0069
Illinois	.0013	.0017	.0612	.0642
Indiana	.0013	.0017	.0230	.0260
Iowa	.0013	.0018	.0144	.0175
Kansas	.0013	.0018	.0087	.0139
Kentucky	.0013	.0021	.0136	.0190
Louisiana	.0013	.0014	.0106	.0135
Maine	.0013	.0019	.0057	.0089
Maryland	.0013	.0019	.0158	.0188
Massachusetts	.0013	.0018	.0283	.0295
Michigan	.0013	.0017	.0434	.0464
Minnesota	.0013	.0017	.0237	.0267
Mississippi	.0013	.0021	.0071	.0105
Missouri	.0013	.0018	.0198	.0229
Montana	.0013	.0018	.0042	.0071
Nebraska	.0013	.0018	.0075	.0106
Nevada	.0013	.0019	.0023	.0055
New Hampshire	.0013	.0019	.0042	.0074
New Jersey	.0013	.0021	.0309	.0336
New Mexico	.0013	.0014	.0044	.0070
New York	.0013	.0021	.0774	.0807
North Carolina	.0013	.0021	.0172	.0206
North Dakota	.0013	.0016	.0041	.0070
Ohio	.0013	.0017	.0457	.0487
Oklahoma	.0013	.0014	.0088	.0126
Oregon	.0013	.0018	.0083	.0112
Pennsylvania	.0013	.0019	.0500	.0531
Rhode Island	.0013	.0019	.0038	.0070
South Carolina	.0013	.0021	.0095	.0119
South Dakota	.0013	.0018	.0038	.0067
Tennessee	.0013	.0021	.0144	.0178
Texas	.0013	.0014	.0381	.0407
Utah	.0013	.0016	.0058	.0087
Vermont	.0013	.0019	.0035	.0067
Virginia	.0013	.0018	.0177	.0209
Washington	.0013	.0016	.0139	.0168
West Virginia	.0013	.0019	.0071	.0102
Wisconsin	.0013	.0017	.0242	.0272
Wyoming	.0013	.0016	.0021	.0050
American Samoa	.0013	.0019	.0001	.0032
Guam	.0013	.0019	.0003	.0035
Puerto Rico	.0013	.0021	.0094	.0128
Virgin Islands	.0013	.0021	.0008	.0036
U.S. Total	.0700	.1000	.8300	1.0000

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Table 8

State	Allocation Factor	Schools & [1] Hospitals	Units of Local Government & Public Care Institutions
Alabama	.0148	32,605,685	3035,399
Alaska	.0029	1,899,889	169,010
Arizona	.0104	1,870,189	182,494
Arkansas	.0097	1,744,895	169,892
California	.0897	8,199,947	857,791
Colorado	.0122	2,741,289	269,619
Connecticut	.0109	2,994,944	291,899
Delaware	.0029	999,899	99,414
Dist. of Columbia	.0023	1,872,529	164,892
Florida	.0057	4,027,942	449,871
Georgia	.0121	3,295,399	316,467
Hawaii	.0052	993,899	99,799
Idaho	.0049	1,236,391	139,107
Illinois	.0542	9,799,899	949,857
Indiana	.0260	4,877,897	464,797
Iowa	.0175	3,192,894	309,539
Kansas	.0128	2,304,199	224,919
Kentucky	.0160	2,999,495	290,999
Louisiana	.0139	2,494,997	239,942
Maine	.0069	1,291,495	125,997
Maryland	.0189	3,579,499	329,599
Massachusetts	.0295	5,129,294	499,575
Michigan	.0484	9,267,819	912,949
Minnesota	.0257	4,912,309	497,993
Mississippi	.0105	1,999,195	199,575
Missouri	.0229	4,119,299	409,994
Montana	.0071	1,272,826	123,749
Nebraska	.0109	1,915,597	199,219
Nevada	.0035	999,779	99,999
New Hampshire	.0074	1,394,799	139,799
New Jersey	.0369	6,999,499	699,739
New Mexico	.0079	1,597,991	159,949
New York	.0957	14,991,999	1,419,899
North Carolina	.0209	3,714,979	391,179
North Dakota	.0079	1,399,491	149,199
Ohio	.0457	8,779,119	869,949
Oklahoma	.0129	2,599,599	239,599
Oregon	.0113	2,997,741	199,197
Pennsylvania	.0991	9,999,919	999,117
Rhode Island	.0079	1,399,599	139,719
South Carolina	.0139	2,139,919	297,999
South Dakota	.0067	1,991,941	119,999
Tennessee	.0179	3,599,419	391,799
Texas	.0497	7,994,949	719,991
Utah	.0097	1,997,999	191,494
Vermont	.0057	1,999,991	99,747
Virginia	.0209	3,747,979	394,979
Washington	.0199	3,997,999	394,979
West Virginia	.0102	1,999,979	179,997
Wisconsin	.0272	4,999,499	479,999
Wyoming	.0039	999,997	97,199
American Samoa	.0052	994,799	99,994
Guam	.0095	999,917	99,999
Puerto Rico	.0139	2,297,399	229,397
Virgin Islands	.0099	993,939	99,999
U.S. Total	1.0000	180,000,199	17,499,999

[1] Allocations are subject to availability of funds.

Several comments expressed doubt as to whether the formula set forth in § 455.101, allocating appropriations among the States, conformed to the requirements of sections 398 and 400H of EPCA. The formula fully complies with the requirements of the law. Pursuant to section 400H of EPCA, the Secretary must allocate grants for units of local government and public care institutions among the States based upon the population and climate of each State and such other factors as the Secretary deems appropriate. The Secretary must also assure that the funds appropriated for grants to schools and hospitals are allocated among the States on the basis of a formula to be prescribed by rule in accordance with the provisions of section 398 of EPCA. Since population and climate factors are to be the principal basis for allocating funds for schools and hospitals, as well as for units of local government and public care institutions, DOE has determined that it is equitable and appropriate to use the same formula for allocating among the States all funds appropriated under Title III for technical assistance programs and energy conservation measures. In conformity with the requirements of section 398 of EPCA, 10 percent of the amounts available will be allocated taking into account energy costs. Another 80 percent of the amounts available will be allocated taking into account the population and climate of each State. DOE has decided to allocate the remaining 10 percent of the available funds so that 7 percent will be divided equally among all States and the remaining 3 percent will be allocated on the basis of population and climate, bringing the total percentage allocated on the basis of population and climate to the 83 percent figure set forth in § 455.101. This formula is used to assure that no eligible State receives less than 0.5 percent of the funds allocated among the States.

The additional requirement to allocate 10 percent of the total available for schools and hospitals determined to be in a class of severe hardship (for additional financial assistance in excess of the 50 percent Federal share, up to 90 percent of the costs of technical assistance programs and energy conservation measures) is satisfied by the requirement that each State reserve 10 percent of its allocation for schools and hospitals each year to provide this additional financial assistance.

State and Grantee Reporting Requirements

Sections 455.63 and 455.73 have been revised in the final regulation to include the requirement that States and grantees which have received financial assistance for energy conservation measures submit regular reports on energy use. These reports are intended to indicate the energy use reductions

that have been realized as a result of energy conservation maintenance and operating procedures and energy conservation measures. This requirement was added to insure that the States and DOE have available accurate information on the actual energy savings resulting from these programs. Further, these reports will encourage participating institutions to establish sound, ongoing energy management practices. An essential ingredient of any effective energy management program is the monitoring of actual energy use levels. These practices are expected to provide significant long-term benefits to institutions in maintaining efficient operations. Grantees will submit reports annually to the States. The States will summarize the reports submitted by the grantees and report the results to DOE in an annual report. Data and information contained in the reports prepared by the grantees will be collected and maintained on a monthly basis or for a period consistent with the billing cycle associated with the relevant fuel type. This reporting requirement will apply for three years or for the life of these programs, whichever is shorter.

Comments DOE Could Not Incorporate

DOE received many comments in response to the notice of proposed rulemaking which suggested revisions to the regulation which the Department was unable to incorporate in the final regulation. These comments included suggestions to: eliminate the matching funds requirement; fund energy conservation measures for units of local government and public care institutions; permit the funding of administrative buildings owned by local education agencies; alter or eliminate the requirement for conformity with the provisions of the Davis-Bacon Act; fund technical assistance programs and energy conservation measures commenced prior to November 9, 1978; eliminate the requirement that funds not obligated be reallocated in the next grant program cycle; and permit units of local government and public care institutions to qualify for hardship funding. Each of these comments proposes a revision to a specific requirement of NECPA. Thus, DOE could not and did not incorporate these comments in this regulation.

V. Additional Information

Environmental Assessment

DOE prepared an environmental assessment of the entire Title III NECPA programs. Notice of the public availability of that environmental assessment, together with the negative determination of environmental impact reached pursuant to an evaluation of the environmental assessment, was published in the Federal Register on March 12, 1979 (44 FR 13554). The negative determination concluded that the programs established by Title III of NECPA did not constitute major Federal actions significantly affecting the quality of the human environment pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 *et seq.*). No material comments were received during the public comment period. Consequently, DOE has finalized, and will act in accordance with, that negative determination.

Regulatory Analysis and Effective Date

The proposed regulation was reviewed in accordance with Executive Order 12044, 43 FR 12661, and was determined to be a "significant regulation" likely to have a "major impact." The proposed regulation was also reviewed in accordance with OMB Circular A-116 and was determined to be a major policy and program initiative.

In consideration of the rapid depletion of the Nation's nonrenewable energy resources and the short-term statutory deadline for issuance of regulations implementing NECPA Title III programs, the Under Secretary of DOE has determined that it is contrary to the public interest to delay issuance of this regulation for preparation of a regulatory analysis and an urban and community impact analysis. However, DOE is in the process of preparing such analyses which will be made available for public review and comment within 90 days of the publication of this regulation. Based on the findings of these analyses and any comments received following public review, DOE may propose appropriate amendments to this regulation.

Also, for the reasons just noted, good cause exists to make this regulation effective upon publication, rather than 30 days thereafter as would otherwise be required under the Administrative Procedure Act. In consideration of the foregoing, Part 455 of Chapter II, Title 10 of the Code of Federal Regulations is amended by adding new Subparts C through I, as set forth below. This amendment shall be effective April 17, 1979.

Issued in Washington, D.C., April 6, 1979.

Omi G. Walden,

Assistant Secretary, Conservation and Solar Applications, Department of Energy.

10 CFR Part 455 is amended by establishing new Subparts C, D, E, F, G, H and I as follows:

Subpart C—Technical Assistance Programs for Schools, Hospitals, Units of Local Government, and Public Care Institutions

Sec.
455.40 Purpose and scope.
455.41 Eligibility.
455.42 Contents of program.

Subpart D—Energy Conservation Measures for Schools and Hospitals

455.50 Purpose and scope.
455.51 Eligibility.
455.52 Contents of program.

Subpart E—Applicant Responsibilities

455.60 Grant application submittals.
455.61 Applicant certifications.
455.62 Grant applications for State administrative expenses.
455.63 Grantee records and reports.

Subpart F—State Responsibilities

455.70 State evaluation of grant applications.
455.71 State ranking of grant applications.
455.72 Forwarding of applications.
455.73 State duties.

Subpart G—Grant Awards

455.80 Approval of grant applications.
455.81 Grant awards for units of local government and public care institutions.
455.82 Grant awards for schools and hospitals.
455.83 Grant awards for State administrative expenses.

Subpart H—State Plan Development and Approval

455.90 Contents of State plan.
455.91 Submission and approval of State plans.
455.92 State plans developed by the Secretary.

Subpart I—Allocation of Appropriations Among the States

455.100 Allocation of funds.
455.101 Allocation formulas.
455.102 Reallocation of funds.

Authority: Title III of the National Energy Conservation Policy Act, Pub. L. 95-619, 92 Stat. 3206 et seq., which establishes Parts G and H of Title III of the Energy Policy and Conservation Act, Pub. L. 94-163, 42 U.S.C. 6321 et seq.; Section 365(e)(2), 42 U.S.C. 6325(e)(2), of the Energy Conservation and Production Act, Pub. L. 94-385, 42 U.S.C. 3801 et seq.; Department of Energy Organization Act, Pub. L. 95-91, 42 U.S.C. 7101 et seq.

Subpart C—Technical Assistance Programs for Schools, Hospitals, Units of Local Government, and Public Care Institutions

§ 455.40 Purpose and scope.

This subpart specifies what constitutes a technical assistance program eligible for financial assistance under this part, and sets forth the eligibility criteria for schools, hospitals, units of local government and public care institutions to receive grants for technical assistance to be performed in buildings owned by such institutions.

§ 455.41 Eligibility.

To be eligible to receive financial assistance for a technical assistance program, an applicant must—

(a) Be a school, hospital, unit of local government or public care institution, all as defined in § 455.2, or a coordinating agency representing a group of eligible institutions and which has been granted authority by the institutions to act in their behalf;

(b) Be located in a State which has an approved State Plan as described in Subpart H of this part;

(c) Have conducted an energy audit or its equivalent, as determined by the State in accordance with the State Plan, for the building for which financial assistance is to be requested, subsequent to the most recent construction, reconfiguration or utilization change which significantly modified energy use within the building;

(d) Give assurance that it has implemented all energy conservation maintenance and operating procedures identified as a result of the energy audit, or provide a satisfactory written justification for not implementing any specific maintenance and operating procedures so identified; and,

(e) Submit an application in accordance with the provisions of this part and the approved State Plan.

§ 455.42 Contents of program.

(a) A technical assistance program shall be conducted by a qualified technical assistance analyst, who shall consider all possible energy conservation measures for a building, including solar or other renewable resource measures. A technical assistance program shall include a detailed engineering analysis to identify the estimated costs of, and the energy and cost savings likely to be realized from, implementing each identified energy conservation maintenance and operating procedure. A technical assistance program shall also identify the estimated cost of, and the energy and cost savings likely to be realized from, acquiring and installing each energy conservation measure, including solar and other renewable resource measures, that indicate a significant potential for saving energy based upon the technical assistance analyst's initial consideration.

(b) At the conclusion of a technical assistance program, the technical assistance analyst shall prepare a final report which shall include—

(1) A description of building characteristics and energy data including—

(i) The results of the preliminary energy audit and energy audit (or its equivalent) of the building;

(ii) The operating characteristics of energy using systems; and

(iii) The estimated remaining useful life of the building;

(2) An analysis of the estimated energy consumption of the building, by fuel type [in total Btu's and Btu/sq. ft./yr), at optimum efficiency (assuming implementation of all energy conservation maintenance and operating procedures);

(3) An evaluation of the building's potential for solar conversion, particularly for water heating systems;

(4) A listing of any known local zoning ordinances and building codes which may restrict the installation of solar systems;

(5) A description and analysis of all recommendations, if any, for acquisition and installation of energy conservation measures, including solar and other renewable resource measures, setting forth—

(i) A description of each recommended energy conservation measure;

(ii) An estimate of the cost of design, acquisition and installation of each energy conservation measure;

(iii) An estimate of the useful life of each energy conservation measure;

(iv) An estimate of increases or decreases in maintenance and operating costs that would result from each energy conservation measure, if any;

(v) An estimate of the salvage value or disposal cost of each energy conservation measure at the end of its useful life, if any;

(vi) An estimate of the annual energy and energy cost savings (using current energy prices) expected from the acquisition and installation of each energy conservation measure. In calculating the potential energy cost savings of each recommended energy conservation measure, including solar or other renewable resource measure, technical assistance analysts shall—

(A) Assume that all energy savings obtained from energy conservation maintenance and operating procedures have been realized;

(B) Calculate the total energy and energy cost savings, by fuel type, expected to result from the acquisition and installation of all recommended energy conservation measures, taking into account the interaction among the various measures; and,

(C) Calculate that portion of the total energy and energy cost savings, as determined in (B) above, attributable to each individual energy conservation measure.

(vii) The simple payback period of each recommended energy conservation measure, taking into account the interactions among the various measures. The simple payback period is calculated by dividing the estimated total cost of the measure, as determined pursuant to § 455.42(b)(5)(ii), by the estimated annual cost saving accruing from the measure, as determined pursuant to § 455.42(b)(5)(vi). For the purposes of ranking applications, the simple payback period shall be calculated using the cost savings resulting from energy savings only, determined on the basis of current energy prices. The estimated cost of the measure shall be the total cost for design and other professional services (excluding costs of a technical assistance program), if any, and acquisition and installation costs. Other economic analyses, such as life-cycle costing, which consider all costs and cost savings, such as maintenance costs and/or savings, resulting from an energy conservation measure, are recommended, but not required, for use by the institution in its decision-making process;

(6) A listing of energy use and cost data for each fuel type used for the prior 12-month period.

(7) A signed and dated certification that the technical assistance program has been conducted in accordance with the requirements of this section and the grant application and that the data presented is accurate to the best of the technical assistance analyst's knowledge.

Subpart D—Energy Conservation Measures for Schools and Hospitals

§ 455.50 Purpose and scope.

This subpart specifies what constitutes an energy conservation measure that may receive financial assistance under this part and sets forth the eligibility criteria for schools and hospitals to receive grants for energy

conservation measures, including solar and other renewable resource measures.

§ 455.51 Eligibility.

(a) To be eligible to receive financial assistance for an energy conservation measure, including solar or other renewable resource measure, an applicant must—

(1) Be a school or hospital, or both as defined in § 455.2, or a coordinating agency which represents groups of eligible institutions and which has been granted authority by the institutions to act in their behalf;

(2) Be located in a State which has an approved State Plan as described in Subpart H of this part;

(3) Have completed a technical assistance program or its equivalent, as determined by the State in accordance with the State Plan, for the building for which financial assistance is to be requested, subsequent to the most recent construction, reconfiguration or utilization change to the building which significantly modified energy use within the building;

(4) Have implemented all energy conservation maintenance and operating procedures which are identified as the result of an energy audit and a technical assistance program, or have provided a satisfactory written justification for not implementing any specific maintenance and operating procedures so identified;

(5) Have no plan or intention at the time of application to close or otherwise dispose of the building for which financial assistance is to be requested within the simple payback period of any energy conservation measure recommended for that building; and

(6) Submit an application in accordance with the provisions of this part and the approved State Plan.

(b) To be eligible for financial assistance, the simple payback period of each energy conservation measure for which financial assistance is requested shall not be less than 1 year nor greater than 15 years, and the estimated useful life of the measure shall be greater than its simple payback period.

§ 455.52 Contents of program.

The programs to be funded under this part will be for the design, acquisition and installation of energy conservation measures to reduce energy consumption or measures to allow the use of solar or other alternative energy resources for schools and hospitals. Such measures include, but are not necessarily limited to—

(a) Insulation, which resists heat transfer from the mechanical systems to the surrounding space, for bare pipes, water heaters, hot water storage tanks, chilled water piping, ductwork and other uninsulated mechanical equipment carrying an above or below ambient temperature fluid;

(b) Roof insulation, which resists heat transfer through the roof;

(c) Ceiling insulation, installed either above or below the ceiling, which resists heat transfer through the ceiling;

(d) Wall insulation, which resists heat transfer through the wall;

(e) Floor insulation, which resists heat transfer through the floor;

(f) Storm windows, which are an additional window, normally installed to the exterior, but which may be installed to the interior of the primary or ordinary window, to increase resistance to heat transfer, and to decrease air infiltration through the window assembly;

(g) Storm doors, which are an extra door installed to the exterior of an exterior door, but also may be installed as part of the entrance vestibule, to decrease heat transfer and air infiltration through the building entrance ways;

(h) Multiglazed window or door systems, which are a single glass unit consisting of multiple layers of glass separated by a hermetically sealed air space, which provide greater resistance to heat transfer;

(i) Reduction in glass area (in other than south-facing glazing systems) through use of methods such as bricking and insulated paneling which decreases heat transfer and air infiltration;

(j) Heat absorbing or heat reflective glazed and coated window and door systems, which are specially treated, coated or laminated glazing systems to absorb or reflect solar heat;

(k) Caulking, which is placed in joints of buildings or window or door systems to prevent the passage of air and moisture through the building envelope;

(l) Weatherstripping, which consists of strips of flexible material placed over, under, or in movable joints of windows and doors to reduce the passage of air and moisture;

(m) Automatic energy control systems, such as mixed air temperature reset devices; cooling coil discharge temperature reset devices; hot deck temperature reset devices; economizer controls; enthalpy controls; night setback thermostats; time clocks to start/stop selected heating, ventilating and air conditioning systems, refrigeration equipment, hot water generators, and associated pumps and fans; thermostatic radiator valves, and central computer control systems, which adjust the supply of heating, cooling, and ventilation to meet space conditioning requirements;

(n) Equipment required to operate or convert to variable energy supply, including—

(1) Automatic ventilating systems to turnoff or vary the consumption of energy systems to deliver no more energy than required at any operating point;

(2) Constant volume air distribution systems altered to variable air flow systems by the addition of variable air flow boxes, fan volume control dampers and related climatic controls; or

(3) Water spray coils for adiabatic cooling during appropriate weather conditions;

(o) Passive solar systems, such as direct gain glazing systems, mass (trombe) wall systems, thermal pond systems, and thermosyphon systems, which utilize elements of the building to collect, store and distribute solar energy for heating and/or cooling, and in which heat flow is by natural means (conduction, convection, radiation or evaporation);

(p) Solar space heating or cooling systems, which consist of solar collectors, and associated thermal storage, heat exchangers, pumps, fans, controls, piping and ducting;

(q) solar electric generating systems, which consist of photovoltaic solar collectors and associated electric storage and controls, or concentrating solar collectors and generating equipment, or wind energy conversion systems;

(r) Solar domestic hot water heating systems, which consist of solar collectors, and associated thermal storage, heat exchangers, pumps, controls and piping, for systems such as domestic hot water, laundry, kitchen, and boiler water makeup;

(s) Furnace or utility plant modifications, which consist of the installation of equipment to achieve reduction in fuel consumption, or to convert to renewable energy sources or coal, including—

(1) Replacement burners, furnaces, boilers, or any combination thereof, which are designed to substantially reduce the amount of fuel consumed as a result of increased combustion efficiency;

(2) Electrical or mechanical furnace ignition systems which eliminate continuous energy use;

(3) Devices for modifying flue openings, such as dampers and heat exchangers, which increase the efficiency of the total heating systems;

(4) Automatic combustion control systems, which improve burner operating performance to reduce consumption of fuel during full- and part-load operation;

(5) Devices, such as turbulators and flow restrictors, for modifying the capacity of boilers or hot water units to reduce oversized equipment to a proper size (after the other building modifications) and to increase the full and part-load efficiency of the primary equipment; and

(6) Equipment required to convert oil-fired and gas-fired units to alternative energy sources, including coal;

(t) Lighting fixture modifications and associated rewiring, which reduce the watts per square foot required for illumination through use of such measures as lamp sources of higher efficiency, or use of non-uniform task lighting design. Lighting fixture modifications that increase the general illumination level of a facility shall not be eligible for funding unless the increase is necessary to conform to any applicable State or local building code;

(u) Energy recovery systems which reduce energy used in heating and cooling systems by—

(1) Direct recycling of uncontaminated air, which has been conditioned, to an adjacent area for heating, cooling or ventilation makeup air;

(2) Exhaust air heat recovery to preheat outside air supply with heat recovery devices such as rotary air wheels, plate heat exchangers, non-regenerative heat-pipe devices, and run-around loop systems; or

(3) Purifying with charcoal or other mediums and recycling exhaust air from toilet areas, dining rooms, and lounges, and other building areas;

(v) Cogeneration systems which produce steam, heat, or other forms of energy as well as electricity for use primarily within a building or complex of buildings and which meet such fuel efficiency requirements as may be prescribed or approved by DOE and which may be new heat recovery equipment added to existing electrical generation systems;

(w) Any otherwise eligible energy conservation measure that involves leased equipment, which will save a substantial amount of energy. Only the costs of installation and connection of such leased equipment are eligible for financial assistance under this program. For purposes of ranking, pursuant to § 455.71(b)(1), a building for which a leased measure has been proposed, the simple payback period shall be determined by dividing the total installation and connection costs by the result of subtracting the average annual recurring lease costs from the projected average annual energy cost saving;

(x) Any other measures an energy audit or a technical assistance report shows, to the satisfaction of the Secretary, will save a substantial amount of energy. Such measures must be specifically identified in the grant application, and a complete description of the measure, together with calculations and other technical data supporting the projected cost and energy savings must be included in the application.

Subpart E—Applicant Responsibilities

§ 455.60 Grant application submittals.

(a) Each eligible applicant desiring to receive financed assistance shall file an applicant in accordance with the provisions of this subpart and the approved State Plan of the State in which such building is located. The application, which may be amended in accordance with applicable State procedures at any time prior to the State's final determination thereon, shall be filed with the State energy agency designated in the State Plan.

(b) Applications from schools, hospitals, units of local government, public care institutions and coordinating agencies for financial assistance for technical assistance programs shall include—

(1) The applicant's name and mailing address;

(2) A written statement certifying that the applicant is eligible under § 455.41;

(3) The results of the preliminary energy audit and energy audit (or its equivalent) for each building for which financial assistance is requested;

(4) A project budget, by building, which stipulates the intended use of all Federal and non-Federal funds, and identifies the sources and amounts of non-Federal funds, including in-kind contributions (limited to the goods and services described in OMB Circular A-102, "Uniform Administrative Requirements for Grants-in-Aid to State and Local Governments", which are directly related to the project and do not include funds derived from revenue sharing or other Federal sources), to be used to meet the cost-sharing requirements described in Subpart G of this part;

(5) A brief description, by building, of the proposed technical assistance program, including a schedule, with appropriate milestone dates, for completing the technical assistance program; and

(6) Additional information required by the applicable State Plan, and any other information which the applicant desires to have considered, such as information to support an application from a school or hospital for financial assistance in excess of the 50 percent Federal share on the basis of severe hardship.

(c) Applications from schools or hospitals and coordinating agencies for financial assistance for energy conservation measures, including solar and other renewable resource measures, shall include—

(1) The applicant's name and mailing address;

(2) A written statement certifying that the applicant is eligible under § 455.51;

(3) Identification of each building pursuant to 10 CFR 450.42(a) (1) through (5) for which financial assistance is requested, including—

(i) Name or other identification of each building and its address;

(ii) Building category;

(iii) Description of functional use;

(iv) Ownership; and

(v) Size of building expressed in gross square feet.

(4) A project budget, by building, which stipulates the intended use of all Federal and non-Federal funds, and identifies the sources and amounts of non-Federal funds, including in-kind contributions (limited to the goods and services described in OMB Circular A-102, "Uniform Requirements for Grants-in-Aid to State and Local Governments", which are directly related to the project and do not include funds derived from revenue sharing or other Federal sources), to be used to meet the cost-sharing requirements described in Subpart G of this part;

(5) A schedule, including appropriate milestone dates, for the completion of the design, acquisition and installation of the proposed energy conservation measures for each building;

(6) A list, by building, of the specific energy conservation measures proposed for funding, indicating the cost of each measure, the estimated energy and energy cost savings of each measure, the projected simple payback period for each measure, computed in accordance with the methodology described in § 455.42(b)(5)(vii) or § 455.52(w), as the case may be, and the average simple payback period for all measures proposed for the building. The average simple payback period of all measures proposed shall be determined by dividing the total estimated cost by the total projected annual cost saving (from energy savings only);

(7) A technical assistance report, completed since the most recent

construction, reconfiguration or utilization change to the building which significantly modified energy use, for each building;

(8) If the applicant is aware of any adverse environmental impact which may arise from adoption of any energy conservation measure, an analysis of that impact and the applicant's plan to minimize or avoid such impact; and

(9) Additional information required by the applicable State Plan, and any additional information which the applicant desires to have considered, such as information to support an application for financial assistance in excess of the 50 percent Federal share on the basis of severe hardship.

(d) Financial assistance for units of local government and public care institutions will be provided only for buildings which are owned and primarily occupied by offices or agencies of a unit of local government or public care institution and which are not intended for seasonal use and not utilized primarily as a school or hospital eligible for assistance under this program.

(e) Financial assistance provided to a school which is a local education agency as defined in § 455.2 must not be used for a technical assistance program or acquisition or installation of any energy conservation measure in any building of such agency which is used principally for administration.

§ 455.81 Applicant Certifications.

Applications for financial assistance for technical assistance programs and energy conservation measures, including solar and other renewable resource measures, shall include a signed statement that the applicant—

(a) Has satisfied the requirements set forth in § 455.80;

(b) Will expend granted funds for the purpose stated in the application and in compliance with the requirements of this part and the applicable approved State Plan;

(c) Has implemented all energy conservation maintenance and operating procedures recommended as a result of the energy audit and, for applications for energy conservation measures, those recommended in the report obtained under a technical assistance program. If any such procedure has not been implemented, the application shall contain a satisfactory written justification for not implementing that procedure;

(d) Will obtain from the technical assistance analyst, before the analyst performs any work in connection with a technical assistance program or energy conservation measure, a signed statement certifying that the technical assistance analyst has no conflicting financial interests and is otherwise qualified to perform the duties of a technical assistance analyst in accordance with the standards and criteria established in the approved State Plan;

(e) Will not enter into any contract relating to an energy conservation measure, which requires or may require expenditure of more than $5,000 (excluding technical assistance costs), that does not conform to the provisions of the Davis-Bacon Act (40 U.S.C. section 276a to 276a–5) pertaining to minimum wages for construction in the applicant's locality; and

(f) Will comply with all reporting requirements contained in § 455.83.

§ 455.82 Grant Applications For State Administrative Expenses.

(a) Each State desiring to receive grants to help defray State administrative expenses shall file applications therefor in accordance with the provisions of this section. Each State may apply for an amount not exceeding 2 percent of its total allocation for technical assistance and energy conservation measures during the initial grant program cycle to the Secretary at any time after the State forwards its State Plan to the Secretary for approval; or, for subsequent grant program cycles, any time after notice by DOE of the amounts allocated to each State for that grant program cycle. In addition, each State after it makes the submittal to DOE required under § 455.72 may apply for a further grant not exceeding 5 percent of the total of all grant awards for technical assistance and energy conservation measures within that State in that grant program cycle, less any amounts previously awarded the State for administrative expenses in the same grant program cycle.

(b) Applications for financial assistance to defray State administrative expenses shall include—

(1) The name and address of the person designated by the State to be responsible for the State's functions under this part; and

(2) An itemized budget, which stipulates the intended use of all Federal and non-Federal funds, for only those State administrative expenses listed in § 455.83(b), and which identifies the sources and amounts of the required matching non-Federal funds, including in-kind contributions (limited to the goods and services described in OMB Circular A–102, "Uniform Requirements for Grants-in-aid to State and Local Governments", which are directly related to the project and do not include funds derived from revenue sharing or other Federal sources), to be used to meet the cost-sharing requirements described in Subpart G of this part.

§ 455.83 Grantee Records and Reports.

(a) Each State, school, hospital, unit of local government, public care institution and coordinating agency which receives a grant for a technical assistance program, energy conservation measure, including solar and other renewable resource measure, or State administrative expenses shall keep all the records required by § 455.4.

(b) By the end of January and July of each year each grantee shall, until the grantee's program has been concluded, submit a report to the State which shall detail and discuss—

(1) Milestones accomplished, those not accomplished, status of in-progress activities, problems encountered, and remedial actions, if any, planned; and

(2) Financial status reports completed in accordance with the documents listed in § 455.3. Financial status reports must be submitted simultaneously to both the State and the Secretary.

(c) Within 90 days of concluding a technical assistance program or installation of funded energy conservation measures, including solar and other renewable resource measures, the grantee shall submit a final report to the State and a summary thereof to the Secretary which shall detail and discuss, as applicable—

(1) A summary of all work accomplished;

(2) Problems encountered;

(3) Final financial reports completed in accordance with the documents listed in § 455.3;

(4) For a completed technical assistance program—

(i) The technical assistance report; and

(ii) A recommended plan to implement energy conservation maintenance and operating procedures, and plans to acquire and install energy conservation measures, including solar and other renewable resource measures;

(5) For completed energy conservation measures including solar and other renewable resource measures—

(i) A listing and description of energy conservation measures acquired and installed;

(ii) A final projected simple payback period, computed in accordance with § 455.42, for each building specifying and utilizing the actual costs for each measure and all the measures, taken as a whole; and

(iii) A statement that the completed modifications (material, equipment and installation) conform to the report on the technical assistance program and the approved grant application.

(d) Grantees shall keep all records required by this section for a minimum of three years after completion of the technical assistance program or energy conservation measure for which the grant was awarded.

(e) Grantees shall submit annual reports to the State covering each year of the three-year period following installation of an energy conservation measure or measures, or for the life of the program, whichever is shorter. Such annual reports shall identify each building and shall provide data on the actual energy use of that building for the preceeding 12-month period. Energy use shall be presented on a monthly or quarterly, as well as an annual basis, consistent with the energy billing cycle for the building. Annual reports shall be submitted within 60 days of the close of each 12-month period.

Subpart F—State Responsibilities

§ 455.70 State Evaluation of Grant Applications.

(a) If an application received by a State is reviewed and evaluated by that State and determined to be in compliance with Subparts C, D and E of this part, § 455.70(b), any additional requirements of the approved State Plan, State environmental laws, and other applicable laws and regulations, then such application will be eligible for financial assistance.

(b) Concurrently with its evaluation and ranking of grant applications pursuant to § 455.71, the State will forward each application for a school or hospital to the State school facilities agency or the State hospital facilities agency, as the case may be, for review and certification that each school application is consistent with related State programs for educational facilities, and each hospital application is consistent with State health plans under sections 1524(c)(2) and 1603 of the Public Health Service Act (42 U.S.C. 300m–3 and 300o–2, respectively), and that each has been coordinated through the review mechanisms under section 1523 of the Public Health Service Act (42 U.S.C. 300m–2) and section 1122 of the Social Security Act. No application from a school or hospital shall be eligible for funding until such certification has been issued.

§ 455.71 State Ranking of Grant Applications.

All eligible applications received by the State will be ranked by the State on an individual building-by-building basis.

(a) For technical assistance programs, buildings shall be ranked in descending priority based upon the energy conservation potential of the building as determined from an energy audit (or its equivalent) in accordance with the procedures established in the State Plan and one or more of the methods indicated in 10 CFR 450.43(c). In the case of buildings having equivalent energy conservation potential, preference shall be given to those buildings which have completed an energy audit without the use of Federal funds.

(1) Each State shall develop separate rankings for all buildings covered by eligible applications for—

(i) Technical assistance programs for units of local governments and public care institutions, and

(ii) Technical assistance programs for schools and hospitals.

(2) Within each ranking for technical assistance, a State shall indicate the amount of financial assistance requested by the applicant for each eligible building and, for those buildings with the highest ranking within the limits of the State's allocation, the amount recommended for funding. If the amount recommended is less than the amount requested by the applicant, the list shall also indicate the reason for that recommendation.

(b) For energy conservation measures, including solar or other renewable energy resource, buildings shall be ranked in descending priority. Several buildings may be ranked as a single building if the application proposes a single energy conservation measure which directly involves all of the buildings. States shall indicate the amount of financial assistance requested by the applicant for each eligible building and, for those buildings with the highest ranking within the limits of the State's allocation, the amount recommended for funding. If the amount recommended is less than the amount requested by the applicant, the list shall also indicate the reason for that recommendation. Buildings shall be ranked in accordance with the procedures established by the State Plan, on the basis of the information developed during a technical assistance program (or its equivalent) for the building and the criteria for ranking applications, which are listed below in the descending order in which weights for each criterion are to be applied by the State—

(1) The average simple payback period of all energy conservation measures proposed for the building, determined by dividing the total estimated cost by the total projected annual energy cost savings;

(2) The type(s) of energy source(s) to which conversion is proposed (with weighting adjustments directly proportional to the ratio of the annual energy cost savings of the conversion measure to the total annual energy cost savings of all measures proposed for a given building), including in descending priority—

(i) Renewable; and

(ii) Coal;

(3) The type(s) and quantity(s) of energy to be saved (with weighting adjustments directly proportional to the ratio of the annual energy savings of each measure to the total annual energy savings of all measures proposed for a given building), including, in descending priority—

(i) Oil;

(ii) Natural gas; and

(iii) Electricity;

(4) Climate within the State; and

(5) Other factors as determined by the State.

(c) Within the rankings of school and hospital buildings for technical assistance and energy conservation measures, including solar or other renewable resource measures, a State shall assure that—

(1) Schools receive not more than 70 percent of the total funds allocated for schools and hospitals to the State in any grant program cycle; and

(2) Hospitals receive not more than 70 percent of the total funds allocated for schools and hospitals to the State in any grant program cycle.

(d) To the extent provided in § 455.82(c), additional financial assistance will be available for schools and hospitals experiencing severe hardship based upon an applicant's long-term need or inability to provide the 50 percent non-Federal share. This additional financial assistance will be available only to the extent necessary to enable such institutions to participate in the program.

(1) Funding for this additional financial assistance will be taken from the funds reserved for grants in excess of 50 percent of the total costs of the technical assistance programs and energy conservation measures.

(2) Applications for Federal funding in excess of 50 percent based on claims of severe hardship shall be given an additional evaluation by the State to assess on a quantifiable basis, to the maximum extent practicable, the

relative need among eligible institutions. The minimum amount of additional Federal funding necessary for the applicant to participate in the program will be determined by the State in accordance with the procedures established in the State Plan and will be based upon one or more of the following—

(i) The ratio of the cost of the proposed technical assistance programs or energy conservation measures to the institution's total annual budget;

(ii) The borrowing capacity of the institution;

(iii) The average unemployment rate for the institution's locality at the time the application is submitted;

(iv) The ratio of the amount expended annually by the institution for energy to the institution's total annual operating budget;

(v) The median annual family income of the institution's locality; and

(vi) Other special conditions of the institution or its locality as determined by the State.

(3) A State shall indicate, for those schools and hospitals with the highest rankings, determined pursuant to paragraphs (a) and (b) of this section—

(i) The amount of additional hardship funding requested by each eligible applicant for each building determined to be in a class of severe hardship, and

(ii) The amount of hardship funding recommended by the State based upon relative need as determined in accordance with the State Plan, to the limit of the hardship funds available.

(e) A State is exempt from the ranking requirements of this section when—

(1) The total amount requested by all applications for schools and hospitals for technical assistance and energy conservation measures in a given grant program cycle for grants up to 50 percent is less than or equal to the funds available to the State for such grants and the total amount recommended for hardship funding is less than or equal to the amounts available to the State for such grants.

(2) The total amount requested by all applications for buildings owned by units of local government and public care institutions in a given grant program cycle is less than or equal to the total amount allocated to the State for technical assistance program grants in the State.

§ 455.72 Forwarding of Applications.

Each State shall forward to the Secretary once each grant program cycle each listing of buildings covered by eligible applications for schools and hospitals or for units of local government and public care institutions, and ranked by the State pursuant to the provisions of § 455.71.

§ 455.73 State Duties.

(a) Each State shall be responsible for—

(1) Consulting with eligible institutions and coordinating agencies representing such institutions in the development of its State Plan;

(2) Notifying eligible institutions and coordinating agencies of the content of the approved State Plan;

(3) Notifying each applicant, prior to submittal of applications to the Secretary, how the applicant's building ranked among other similar buildings, and whether and to what extent its application will be recommended for funding or, if not to be recommended for funding, the reason therefore;

(4) Certifying that each institution that has submitted an application to be recommended for funding has given its assurance that it is willing and able to participate on the basis of the amounts recommended for that institution in the State ranking pursuant to § 455.71; and

(5) Direct program oversight, monitoring and financial auditing of the activities for which grants are awarded to its institutions to insure compliance with all legal requirements. States shall immediately notify the Secretary of any non-compliance or indication thereof.

(b) Each State shall submit a report to the Secretary, by the close of each February and August following State Plan approval for the duration of the grant program, providing—

(1) A narrative of the program, including objectives accomplished, problems encountered and recommended solutions;

(2) A detailed report on program related financial expenditures by all grantees and by the State;

(3) A summary of the most recent reports received by the State pursuant to § 455.63; and

(4) Such other information as the Secretary may, from time to time, request.

(c) Each State shall include in the August report required by paragraph (b) of this section, an estimate of annual energy use reductions in the State, by energy source, attributable to implementation of energy conservation maintenance and operating procedures and installation of energy conservation measures under this program. Such estimates shall be based upon a sampling of institutions participating in the technical assistance phase of this program and upon the reports submitted to the State pursuant to § 455.63(a).

Subpart G—Grant Awards

§ 455.80 Approval of Grant Applications.

(a) The Secretary shall review and approve applications submitted by a State in accordance with § 455.72 if the Secretary determines that the applications meet the objectives of the Act, and comply with the applicable State Plan and the requirements of this part. The Secretary may disapprove all or any portion of an application to the extent that funds are not available to carry out a program or measure [or portion thereof] contained in the application, or for such other reason as the Secretary may deem appropriate.

(b) The Secretary shall notify a State and the applicant of the final approval or disapproval of an application at the earliest practicable date after the Secretary's receipt of the application, and, in the event of disapproval, shall include a statement of the reasons therefor. An application which has been disapproved may be amended and resubmitted in the same manner as the original application at any time within a grant program cycle.

(c) The Secretary shall award only one grant to an applicant for any single technical assistance program or energy conservation measure for any one building. Financial assistance under this part for any single technical assistance program or energy conservation measure shall not exceed the amount of the initial grant award.

§ 455.81 Grant Awards For Units of Local Government and Public Care Institutions.

(a) The Secretary may make grants to units of local governments, public care institutions and coordinating agencies for up to 50 percent of the costs of performing technical assistance programs for buildings covered by an application approved in accordance with § 455.80.

(b) Total grant awards within any State to units of local government and public care institutions are limited to the funds allocated to each State in accordance with Subpart I of this part.

(c) No grant awarded under this section for a technical assistance program shall include funding for the purchase of any single item of equipment or personal property having an acquisition cost in excess of $500.

§ 455.82 Grant Awards For Schools and Hospitals.

(a) The Secretary may make grants to schools, hospitals and coordinating agencies for up to 50 percent of the cost of performing technical assistance programs for buildings covered by an

application approved in accordance with § 455.80. Grant awards for technical assistance programs in any State within any grant program cycle shall not exceed—

(1) 30 percent of the amount allocated to a given State from the 1978 fiscal year appropriation for technical assistance programs and energy conservation measures for schools and hospitals;

(2) 15 percent of the amount allocated to a given State from the 1979 fiscal year appropriation for technical assistance programs and energy conservation measures for schools and hospitals;

(3) 5 percent of the 1980 fiscal year appropriation for technical assistance programs and energy conservation measures for schools and hospitals.

(b) The Secretary may make grants to schools, hospitals and coordinating agencies for up to 50 percent of the costs of acquiring and installing energy conservation measures, including solar and other renewable resource measures, for buildings covered by an application approved in accordance with § 455.80.

(c) The Secretary may award 10 percent of the total amount allocated to a State for schools and hospitals for technical assistance programs and energy conservation measures in a given grant program cycle to cover more than 50 percent, but not to exceed 90 percent, of the cost of a technical assistance program or an energy conservation measure. These additional amounts may be awarded to applicants in a class of severe hardship, ascertained by the State in accordance with the State Plan, for buildings recommended by the State pursuant to § 455.71(d)(3), and in amounts determined pursuant to § 455.71(d)(2).

(d) The Secretary shall not award more than 70 percent of the total amount allocated to a State for technical assistance programs and energy conservation measures in a given grant program cycle to either schools or hospitals in that State.

(e) No grant awarded under this section for a technical assistance program shall include funding for the purchase of any single item of equipment or other personal property having an acquisition cost in excess of $500.

(f) Applicant expenditures for a technical assistance program commenced after November 8, 1978 for a building may be wholly or partially classified in the discretion of the Secretary as matching non-Federal funds for the purposes of matching grants awarded for energy conservation measures.

§ 455.83 Grant Awards For State Administrative Expenses.

(a) For the purpose of defraying State expenses in the administration of technical assistance programs and energy conservation measures, the Secretary may make grant awards to a State—

(1) Immediately following approval of the State Plan, or for subsequent grant program cycles, immediately following public notice of the amounts allocated to a State for the grant program cycle, and upon approval of the grant application for administrative costs, in an amount not exceeding 2 percent of that State's total allocation for a given grant program cycle for technical assistance and energy conservation measures. Grants for such purposes may be made for up to 50 percent of a State's projected administrative expenses, as approved by the Secretary; and

(2) Concurrently with grant awards for approved applications for technical assistance or energy conservation measures for institutions in that State, and upon approval of an application for administrative costs, in an amount not exceeding the difference between the amount granted pursuant to subparagraph (1) of this paragraph and 5 percent of the total amount of grants awarded within the State for technical assistance programs and energy conservation measures in the applicable grant program cycle. Grants for such purposes may be made for up to 50 percent of a State's projected administrative expenses, as approved by the Secretary. The total of all grants for State administrative costs, technical assistance programs and energy conservation measures in that State shall not exceed the total amount allocated for that State for any grant program cycle.

(b) A State's administrative expenses shall be limited to those directly related to administration of technical assistance programs and energy conservation measures including costs associated with—

(1) Personnel, whose time is expended directly in support of such administration;

(2) Supplies, and services, expended directly in support of such administration;

(3) Equipment purchased or acquired solely for, and utilized directly in support of such administration: *Provided*, That no single item of equipment or other personal property costing more than $300 shall be acquired without the express consent of DOE;

(4) Printing, directly in support of such administration; and

(5) Travel, directly related to such administration.

Subpart H—State Plan Development and Approval

§ 455.90 Contents of State Plan.

Each State shall develop a State Plan for technical assistance programs and energy conservation measures, including solar and other renewable resource measures. The State Plan shall be reviewed and approved by State energy agency. The State Plan shall include—

(a) A statement setting forth the procedures by which the views of eligible institutions or coordinating agencies representing such institutions, or both, were solicited and considered during development of the State Plan;

(b) The procedures the State will follow to notify eligible institutions and coordinating agencies of the content of the approved State Plan;

(c) The procedures for submittal of grant applications to the State;

(d) A description and evaluation of the results of preliminary energy audits (described in Subpart B of this part) which have been conducted in the State including, but not limited to—

(1) In the case of a State which has completed preliminary energy audits of all potentially eligible buildings, a summary of the data gathered pursuant to § 450.42 for all such buildings;

(2) In the case of a State which has completed preliminary energy audits of a sample of all potentially eligible buildings within the State—

(i) Reasonably accurate estimates of the preliminary energy audit data required by 10 CFR 450.42 for all potentially eligible buildings within the State; and

(ii) A plan which describes further actions to be taken to complete preliminary energy audits of all potentially eligible buildings;

(e) The procedures to be used by the State for evaluating and ranking technical assistance and energy conservation measure grant applications pursuant to § 455.71, including the weights assigned to each criterion set forth in § 455.71(b);

(f) The procedures that the State will follow to insure that funds will be allocated equitably among eligible applicants within the State, including procedures to insure that funds will not be allocated on the basis of size or type of institution but rather on the basis of relative need taking into account such factors as cost, energy consumption and energy savings, in accordance with § 445.71;

(g) The procedures that the States will follow for identifying schools and hospitals experiencing severe hardship and for apportioning the funds that are available for schools and hospitals in a class of severe hardship. Such policies and procedures shall be in accordance with § 455.71(d);

(h) A statement setting forth the extent to which, and by which methods, the State will encourage utilization of solar space heating, cooling and electric systems and solar water heating systems;

(i) The procedures to assure that all financial assistance under this part will be expended in compliance with the requirements of the State Plan, in compliance with the requirements of this part, and in coordination with other State and Federal energy conservation programs;

(j) The procedures to insure implementation and continued use of energy conservation maintenance and operating procedures in those buildings for which financial assistance is awarded under this part;

(k) The procedures designed to insure that financial assistance under this part will be used to supplement, and not to supplant, State, local or other funds;

(l) The procedures for determining that energy audits performed without the use of Federal funds have been performed in substantial compliance with the requirements of 10 CFR Part 450 for the purposes of satisfying the eligibility requirements contained in § 455.41(c);

(m) The procedures for establishment of, and adherence to, milestones for accomplishment of technical assistance programs and energy conservation measures receiving financial assistance under this part;

(n) The procedures for determining that technical assistance programs performed without the use of Federal funds have been performed in compliance with the requirements of § 455.42, for the purposes of satisfying the eligibility requirements contained in § 455.51(a)(3).

(o) The procedures for State management, financial audit, monitoring and evaluation of technical assistance programs and energy conservation measures receiving financial assistance under this part;

(p) A description of the State's program for establishing and insuring compliance with qualifications for technical assistance analysts. Such policies shall require that technical assistance analysts—

(1) Have experience in energy conservation and be a registered professional engineer licensed under the regulatory authority of the State;

(2) Be an architect-engineer team, the principal members of which are licensed under the regulatory authority of the State; or

(3) Be otherwise qualified in accordance with such criteria as the State may prescribe in its State Plan to insure that individuals conducting technical assistance programs possess the appropriate training and experience in building energy systems. Such policies shall also require that technical assistance analysts be free from financial interests which may conflict with the proper performance of their duties; and

(q) The procedures for apportionment of funds among eligible institutions within the State. As a minimum, such policies and procedures shall assure a separate priority ranking pursuant to the provisions of § 455.71 for each building covered by an application approved pursuant to the provisions of § 455.70 for—

(1) Technical assistance programs for units of local government and public care institutions;

(2) Technical assistance programs for schools and hospitals; and

(3) Energy conservation measures, including solar and other renewable resource measures, for schools and hospitals.

§ 455.91 Submission and Approval of State Plans.

(a) Proposed State Plans shall be submitted to the Secretary within 120 days of the effective date of this subpart unless the Secretary, upon request and for good cause shown, grants an extension of time.

(b) The Secretary shall, within 60 days of receipt of a proposed State Plan, review each Plan and, if it is found to conform to the requirements of this part, approve the State Plan. If the Secretary does not disapprove a State Plan within the 60-day period, the Secretary will be deemed to have approved the State Plan.

(c) If the Secretary determines that a proposed State Plan fails to comply with the requirements of this part, the Secretary shall return the Plan to the State with a statement setting forth the reasons for disapproval. With the written consent of the Secretary, the State may submit a new or amended Plan at any time.

§ 455.92 State Plans Developed by the Secretary.

(a) If a State Plan has not been approved by February 7, 1981, or within 90 days after completion of the preliminary energy audits, whichever is later, the Secretary may develop and implement a State Plan on behalf of the schools and hospitals in the State.

(b) Subsequent to the development of a State Plan by the Secretary, the State may submit its own State Plan and the Secretary shall approve or disapprove such plan within 60 days after receipt by the Secretary. If the proposed plan meets the requirements of this part, and is not inconsistent with any plan developed and implemented by the Secretary, the Secretary shall approve the State Plan which shall automatically replace the Plan developed by the Secretary.

Subpart I—Allocation of Appropriations Among the States.

§ 455.100 Allocation of Funds.

(a) The Secretary will allocate available funds among the States for the purpose of awarding grants to schools, hospitals, units of local government, and public care institutions and coordinating agencies to implement technical assistance and energy conservation measures grant programs in accordance with this part.

(b) By notice published in the Federal Register, the Secretary shall notify each State of the total amount allocated for grants within the State for any grant program cycle.

(c) By notice published in the Federal Register, the Secretary shall notify each State of the period for which funds allocated for a grant program cycle will be reserved for grants within the State.

(d) Each State shall apportion ten percent of its allocation for schools and hospitals in each grant program cycle to provide additional financial assistance, in excess of the 50 percent Federal share but not to exceed 90 percent, for technical assistance programs and energy conservation measures for schools and hospitals determined to be in a class of severe hardship. Such determinations shall be made in accordance with § 455.71(d).

§ 455.101 Allocation Formulas.

(a) Financial assistance for conducting technical assistance programs for units of local government and public care institutions shall be allocated among the States by multiplying the sum available by the allocation factor set forth in paragraph (c) of this section.

(b) Financial assistance for conducting technical assistance programs and acquiring and installing energy conservation measures, including solar and other renewable resource

measures, for schools and hospitals shall be allocated among the States by multiplying the sum available by the allocation factor set forth in paragraph (c) of this section.

(c) The allocation factor (K) shall be determined by the formula—

$$K = \frac{0.07}{n} + 0.1\ \frac{(Sfc)}{(Nfc)} + 0.83\ \frac{(SP)\,(SC)}{(NPC)}$$

where, as determined by DOE—

(1) Sfc is the average retail cost per million Btu's of energy consumed within the region in which the State is located, as reflected in the 1985, Series C projections prepared for DOE's Energy Information Administration Administrator's Annual Report, 1977;

(2) Nfc is $271.95, the summation of the Sfc numerators for all States;

(3) n is the total number of eligible States;

(4) SP is the population of the State, as determined from 1978 census estimates, "Current Population Reports", Series P-25, number 603;

(5) SC is the sum of the State's heating and cooling degree days, as determined from National Oceanic and Atmospheric Administration data for the thirty year period, 1941 through 1970;

(6) NPC is 1,277,259,000, the summation of the (SP) (SC) numerators for all States.

(d) Except for the District of Columbia, Puerto Rico, Guam, American Samoa and the Virgin Islands, no allocation available to any State may be less than 0.5 percent of all amounts allocated in any grant program cycle. No State will be allocated more than 10 percent of the funds allocated in any grant program cycle.

§ 455.102 Reallocation of Funds

(a) If a State Plan has not been approved and implemented by a State by the close of the period for which allocated funds are available as set forth in the notice issued by the Secretary pursuant to § 455.100(d), funds allocated to that State for technical assistance and energy conservation measures will be reallocated among all States for the next grant program cycle, if available.

(b) If a State Plan has not been approved by February 7, 1981, or within ninety days after completion of the preliminary energy audits, whichever is later, the Secretary may develop and implement a State Plan on behalf of the schools and hospitals within the State. If the Secretary does not develop a State Plan for a State, the funds reserved for that grant program cycle for schools and hospitals in that State will be reallocated for the next grant program cycle among all States for schools and hospitals.

(c) If a State does not forward a sufficient number of grant applications to award all the funds allocated for the State in any grant program cycle, the Secretary shall reallocate the funds which remain available among all States for the next grant program cycle.

(d) If a State does not forward a sufficient number of grant applications under the severe hardship provisions set forth in § 455.71(d) to award 10 percent of all of the funds allocated to the State for schools and hospitals in that grant program cycle, the Secretary shall reallocate the remaining hardship funds among all States for the next grant program cycle.

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SPECIAL NOTES TO THE AUDITOR

Please make the following corrections to this manual.

1. Page 65, PEA-6:

   Change item 3.0 under "Energy Saving Potential Tabulation" from a Weighting Factor (WF) of 9.2 to 9.0.

2. Page 75, EA-2:

   a. Delete the hand printed note "All Figures Below Are Best Estimates" in section 1.0, middle of the form. This section should only be be completed for metered buildings. Please add "only for metered buildings" to the instructions for (2) through (ff) on page 69 and on blank form page 140 after 1.0.

   b. The numbers in columns (aa), (bb) and (dd) relating to BTU consumption are x 10^6 (x 1,000,000). It is optional to use x 10^6 or the complete number on the audit forms as long as the method used is consistant.

   c. Note that all values for energy consumption under "Central Plant Thermal (dd)", Steam-Hot Water column should be entered in BTU.

3. Page 76, EA-3:

   a. Add checks (✓) to items under "System Changes" corresponding to items on EA-2 page 75 under 2.0 (gg), M & O Procedures.

   b. Circle numbers under "Values" as follows: Variable Ventilation 1.0, Unoccupied Reset or Shut Down of System 2.0, Shut down Non-Critical Exhaust Systems 1.0, Reduce Illumination Levels 3.0, Maximize Use Of Daylight 1.0, Install High Efficiency Lamps 1.0, Reduction of Water Consumption 0.5, Increase Chilled Water Temperature 1.0, Adjustment of Air/Fuel Ratio 0.5, Combustion Monoriting and Control 0.5, Steam Trap Maintenance 1.5, Pipe Insulation Repair 1.0.

SUPPLEMENTAL WEATHER DATA

The following weather data is to assist you in completing Energy Audit Form EA-2, Pages 75 (example) and 140 (blank) in your manual. It will preclude the necessity of obtaining weather data from the local weather station or obtaining from some other source data required for Items 4.1, 4.2, 4.3(B), and 1.0(Z). Use the nearest city to the audit location.

Fiscal year 1.0(Z) monthly and total degree day history (for metered buildings only):

ABILENE, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1947-48	0	0	0	101	487	486	642	390	344	160	16	0	3032
1948-49	0	0	0	188	310	696	686	367	298	183	8	0	2836
1949-50	0	0	0	118	318	536	636	643	482	81	48	0	3048
1950-51	0	0	3	88	261	739	749	473	341	114	10	3	2668
1951-52	0	0	26	71	449	616	777	310	378	113	8	0	2747
1952-53	0	0	2	48	299	562	689	362	287	51	13	0	2511
1953-54	0	0	2	6	251	723	573	573	258	36	6	3	2433
1954-55	0	0	2	44	293	589	519	538	332	39	0	0	2402
1955-56	0	0	4	67	117	424	701	370	261	122	42	0	2418
1956-57	0	0	0	119	198	632	332	589	134	14	23	0	2181
1957-58	0	0	17	110	321	654	648	411	268	136	15	0	2884
1958-59	0	0	0	42	387	599	520	468	301	53	13	1	2426
1959-70	0	0	0	198	398	528	748	449	482	92	31	1	2813
1970-71	0	0	15	147	414	411	800	488	384	96	22	0	2438
1971-72	0	0	44	44	312	692	691	464	297	49	12	0	2273
1972-73	0	0	13	138	394	702	844	574	299	228	43	0	3331
1973-74	0	0	0	60	227	557	650	389	191	76	7	0	2165
1974-75	0	0	46	67	460	631	620	553	391	144	7	0	2933
1975-76	0	0	28	97	327	578	692	575	294	68	32	0	2420
1976-77	0	0	11	276	378	696	861	363	262	89	0	0	3157
1977-78	0	0	0	54	314	586							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	0	0	3	83	190	412	699	664	338	183	12	0	2482
1970	2	0	3	104	362	439	607	560	411	104	6	1	2467
1971	0	6	28	88	286	499	697	376	197	83	30	0	2286
1972	0	12	41	188	180	575	697	492	350	128	1	0	2596
1973	0	0	0	44	224	379	588	588	277	111	32	0	2125
1974	0	7	112	102	354	480	607	430	184	63	8	0	2267
1975	0	0	30	99	173	411	482	919	234	128	13	0	2859
1976	0	21	48	67	143	424	481	531	275	31	0	0	1923
1977	0	4	13	17	267	496	598	579	334	122	7	1	2438

AMARILLO, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1947-48	0	0	48	303	721	683	867	758	661	412	66	5	4721
1948-49	0	0	37	235	548	852	1008	716	584	321	74	5	4374
1949-50	0	0	44	311	671	758	1033	969	696	214	80	0	4776
1950-51	0	0	27	219	598	939	935	716	597	303	95	7	4219
1951-52	0	0	48	189	702	879	1024	840	592	254	33	13	4254
1952-53	0	0	28	139	588	761	1114	848	638	139	41	7	3850
1953-54	0	0	11	42	498	1000	885	949	618	235	33	7	4223
1954-55	0	0	48	149	517	795	740	782	828	194	96	7	4089
1955-56	0	0	72	191	378	676	1148	987	494	312	99	1	4188
1956-57	0	23	32	250	593	908	763	675	534	159	153	0	3679
1957-58	0	1	28	189	544	911	820	777	584	298	109	0	4164
1958-59	0	0	4	139	583	862	726	681	598	176	69	24	4007
1959-70	0	0	1	276	563	817	981	682	713	288	90	33	4394
1970-71	0	0	47	299	544	801	827	728	536	298	89	0	4077
1971-72	1	0	128	263	579	843	908	692	498	263	105	0	4094
1972-73	13	2	48	274	633	927	972	786	568	438	113	0	4994
1973-74	0	0	84	154	480	813	922	633	566	198	17	0	3873
1974-75	0	0	119	199	571	898	853	826	612	323	67	16	4476
1975-76	0	0	104	138	549	737	881	692	587	233	171	0	3932
1976-77	0	0	99	464	798	864	1073	893	696	219	22	0	4962
1977-78	0	0	1	138	522	768							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	0	0	0	20	147	284	330	478	196	34	0	0	1713
1970	0	0	0	14	176	327	493	448	231	24	0	0	1713
1971	0	0	12	10	94	324	381	332	198	10	0	0	1271
1972	0	0	4	44	39	289	513	285	182	66	0	0	1212
1973	0	0	0	0	23	310	614	493	173	67	1	0	1436
1974	0	0	0	32	228	305	449	374	61	20	0	0	1360
1975	0	0	0	24	61	273	390	367	134	46	0	0	1295
1976	0	0	0	13	32	223	312	318	118	3	0	0	1019
1977	0	0	0	10	100	399	493	389	287	22	0	0	1700

NOTE: See Page 210 for Items 4.1, 4.2 and 4.3(B).

AUSTIN, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	48	298	578	496	437	314	53	0	0	1999
1958-59	0	0	0	74	184	905	530	346	108	112	0	0	1054
1959-60	0	0	0	38	383	948	492	499	358	17	12	0	2149
1960-61	0	0	0	28	182	518	582	399	114	88	0	0	1797
1961-62	0	0	0	21	270	604	598	161	243	48	0	0	1745
1962-63	0	0	0	28	172	429	657	376	109	27	4	0	1792
1963-64	0	0	0	0	137	618	681	479	154	20	0	0	1847
1964-65	0	0	0	17	198	413	370	431	367	12	0	0	1770
1965-66	0	0	2	38	76	288	611	449	168	24	11	0	1667
1966-67	0	0	0	31	109	453	446	380	77	0	2	0	1498
1967-68	0	0	7	41	192	477	538	510	268	37	1	0	2064
1968-69	0	0	0	7	294	446	368	243	354	4	1	0	1813
1969-70	0	0	0	69	253	339	693	330	309	47	10	0	2010
1970-71	0	0	3	75	340	331	328	309	171	32	0	0	1400
1971-72	0	0	0	0	184	271	434	298	68	6	0	0	1262
1972-73	0	0	0	46	375	513	385	405	72	128	3	0	2125
1973-74	0	0	0	8	83	387	496	258	108	36	0	0	1376
1974-75	0	0	3	11	271	441	377	358	284	53	0	0	1718
1975-76	0	0	1	27	204	404	476	158	173	19	3	0	1465
1976-77	0	0	0	170	402	506	719	308	148	20	0	0	2273
1977-78	0	0	0	16	136	394							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	23	5	8	132	276	676	668	620	630	186	46	1	2893
1970	8	1	10	169	235	651	589	651	633	134	22	43	2764
1971	14	20	86	157	355	570	656	511	426	229	53	13	3108
1972	6	34	111	269	272	510	547	571	529	239	16	3	3107
1973	1	0	34	78	277	407	557	550	447	203	93	4	2649
1974	4	21	160	159	398	483	606	513	329	157	34	4	2751
1975	21	9	47	141	277	434	536	552	329	187	72	22	2628
1976	9	57	85	115	186	451	479	377	401	61	6	0	2418
1977	0	7	38	90	324	526	629	681	572	227	48	7	3141

BROWNSVILLE, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	18	102	94	219	117	102	0	0	0	652
1958-59	0	0	0	32	53	212	268	153	84	27	0	0	829
1959-60	0	0	0	3	169	107	173	139	104	5	0	0	720
1960-61	0	0	0	2	41	229	302	123	14	14	0	0	727
1961-62	0	0	0	1	37	138	292	23	79	7	0	0	577
1962-63	0	0	0	0	28	140	282	165	17	0	0	0	690
1963-64	0	0	0	0	48	342	284	190	34	0	0	0	823
1964-65	0	0	0	3	52	215	127	135	138	0	0	0	673
1965-66	0	0	0	8	8	76	333	239	63	1	0	0	730
1966-67	0	0	0	4	48	185	238	151	92	0	0	0	658
1967-68	0	0	1	4	8	176	262	218	126	4	0	0	797
1968-69	0	0	0	0	73	96	141	45	115	0	0	0	470
1969-70	0	0	0	0	92	89	256	72	76	4	1	0	570
1970-71	0	0	1	3	86	46	130	79	38	6	0	0	388
1971-72	0	0	0	0	16	87	112	93	11	2	0	0	301
1972-73	0	0	0	0	144	217	339	190	4	27	0	0	921
1973-74	0	0	0	0	16	130	190	102	40	5	0	0	483
1974-75	0	0	0	3	77	169	177	90	31	5	0	0	552
1975-76	0	0	0	5	74	180	215	74	22	0	0	0	570
1976-77	0	0	0	21	177	256	319	123	43	3	0	0	942
1977-78	0	0	0	0	29	101							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	123	71	72	335	437	570	695	624	511	390	196	87	4071
1970	39	48	116	356	364	522	597	668	540	330	128	202	3886
1971	183	142	244	294	459	541	578	564	498	379	193	143	4200
1972	148	91	244	382	398	473	512	562	517	395	93	53	3834
1973	19	21	178	242	404	490	585	519	504	365	369	74	3710
1974	83	73	299	329	520	483	534	524	438	273	130	59	3871
1975	79	68	223	365	526	536	548	548	408	315	176	69	3857
1976	41	97	216	283	343	507	511	547	509	190	59	24	3327
1977	15	44	174	272	476	535	615	638	585	384	177	88	4023

CORPUS CHRISTI, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	31	161	157	307	232	176	7	0	0	1071
1958-59	0	0	0	38	93	292	382	227	105	39	0	0	1176
1959-60	0	0	0	9	253	190	299	288	199	16	1	0	1255
1960-61	0	0	0	12	78	230	408	185	39	35	0	0	1088
1961-62	0	0	0	4	123	228	448	31	142	10	0	0	998
1962-63	0	0	0	4	83	274	484	271	34	0	0	0	1136
1963-64	0	0	0	0	69	440	283	324	87	7	0	0	1190
1964-65	0	0	0	15	70	289	219	252	232	0	0	0	1078
1965-66	0	0	0	22	14	125	450	300	79	12	1	0	1003
1966-67	0	0	0	9	68	267	304	222	42	0	0	0	908
1967-68	0	0	0	17	63	299	373	362	202	9	0	0	1325
1968-69	0	0	0	3	144	219	237	144	224	0	0	0	975
1969-70	0	0	0	10	140	132	442	168	104	29	2	0	1129
1970-71	0	0	2	12	125	93	176	191	64	26	0	0	667
1971-72	0	0	0	0	51	112	188	168	22	2	0	0	961
1972-73	0	0	0	8	168	295	413	267	28	44	0	0	1233
1973-74	0	0	0	0	20	204	264	191	98	13	0	0	788
1974-75	0	0	0	4	117	260	227	167	77	18	0	0	882
1975-76	0	0	0	4	107	247	273	99	48	1	0	0	773
1976-77	0	0	0	59	253	311	439	192	65	6	0	0	1341
1977-78	0	0	0	4	56	140							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	62	16	11	180	332	521	677	636	476	300	103	48	3374
1970	28	8	47	287	329	466	552	599	485	255	89	166	3297
1971	98	74	187	207	423	562	625	535	489	367	121	116	3805
1972	93	61	187	360	360	520	594	588	561	368	68	28	3868
1973	13	14	149	178	381	489	629	560	511	353	265	68	3591
1974	93	90	243	276	498	486	587	537	510	289	97	32	3667
1975	78	39	194	319	486	557	608	573	432	300	161	32	3737
1976	23	84	170	265	399	505	516	563	498	136	31	3	3869
1977	4	18	104	206	435	549	616	677	621	342	136	71	3773

DALLAS/FORT WORTH, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	144	402	610	615	592	496	138	9	0	2806
1958-59	0	0	0	82	247	659	690	452	276	143	4	0	2553
1959-60	0	0	0	68	470	630	643	639	499	34	32	0	2855
1960-61	0	0	0	45	253	658	760	608	299	122	9	2	2657
1961-62	0	0	0	30	301	590	781	328	345	107	2	0	2584
1962-63	0	0	0	46	280	595	839	517	185	34	13	0	2459
1963-64	0	0	0	4	227	780	651	608	298	63	1	0	2601
1964-65	0	0	0	81	260	550	930	930	551	36	0	0	2564
1965-66	0	0	2	60	103	376	760	562	274	84	26	0	2227
1966-67	0	0	0	79	182	627	514	503	146	13	21	0	2087
1967-68	0	0	13	85	282	568	831	598	330	100	2	0	2584
1968-69	0	0	0	47	348	560	692	615	438	49	6	4	2170
1969-70	0	0	0	116	306	483	756	655	404	63	21	1	2589
1970-71	0	0	7	103	316	389	564	440	387	97	19	9	2224
1971-72	0	0	12	7	270	389	615	398	143	26	1	0	1861
1972-73	0	0	3	96	446	644	690	675	195	182	12	0	2703
1973-74	0	0	1	38	182	509	656	552	173	70	1	0	1980
1974-75	0	0	20	16	296	544	489	508	355	112	0	0	2342
1975-76	0	0	4	35	266	500	616	217	232	48	20	0	1924
1976-77	0	0	0	214	459	614	931	431	241	37	0	0	2927
1977-78	0	0	0	33	237	536							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	31	3	3	67	228	423	715	662	372	123	17	9	2596
1970	5	0	7	108	236	435	595	659	494	113	12	22	2595
1971	8	4	21	71	195	546	606	636	392	171	36	1	2491
1972	2	14	37	189	249	498	589	618	480	183	4	0	2859
1973	1	0	6	60	230	435	595	559	342	146	33	0	2405
1974	8	2	115	101	341	419	660	565	202	133	20	2	2978
1975	0	0	15	107	236	483	580	620	391	189	39	9	2669
1976	0	32	99	52	138	421	537	602	330	72	0	0	2251
1977	0	0	7	94	391	581	693	624	505	112	6	2	3017

DEL RIO, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	3	216	326	438	340	224	17	4	0	1568
1958-59	0	0	0	27	283	362	486	268	153	69	0	0	1620
1959-60	0	0	0	68	184	439	410	373	293	19	1	0	1738
1960-61	0	0	0	20	366	337	338	268	67	23	0	0	1613
1961-62	0	0	0	17	137	499	350	99	105	21	0	0	1482
1962-63	0	0	0	0	9	246	367	359	362	71	13	0	1547
1963-64	0	0	0	0	3	112	386	484	485	91	15	0	1697
1964-65	0	0	0	0	21	152	417	326	387	268	4	0	1585
1965-66	0	0	0	3	16	41	283	334	388	128	8	9	1410
1966-67	0	0	0	0	26	93	434	417	299	54	0	0	1323
1967-68	0	0	0	1	34	139	475	466	419	246	28	0	1830
1968-69	0	0	0	0	9	223	419	324	260	266	1	0	1479
1969-70	0	0	0	0	62	273	330	391	277	242	46	7	1782
1970-71	0	0	24	69	233	224	278	229	197	35	0	0	1289
1971-72	0	0	9	6	135	293	356	228	54	2	0	0	1827
1972-73	0	0	0	21	283	429	531	381	311	72	0	0	1749
1973-74	0	0	0	1	83	362	363	231	92	11	0	0	1184
1974-75	0	0	0	9	223	431	373	274	114	22	0	0	1436
1975-76	0	0	0	10	180	361	456	125	76	3	9	0	1222
1976-77	0	0	0	127	348	481	548	369	132	13	0	0	1928
1977-78	0	0	0	4	126	294							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	6	13	32	193	330	590	735	660	495	175	46	0	3235
1970	3	0	19	200	286	496	642	637	443	133	11	0	2868
1971	10	19	114	196	421	601	534	429	423	201	43	0	2859
1972	3	37	161	317	319	521	566	496	473	241	18	1	3149
1973	0	0	66	170	410	460	530	586	483	207	69	0	2983
1974	2	18	178	237	489	365	654	584	278	177	23	2	3199
1975	13	1	83	205	363	534	588	582	369	202	78	13	2927
1976	0	76	130	168	253	534	618	521	419	73	3	0	2587
1977	0	7	63	121	334	543	649	723	630	239	34	6	3339

EL PASO, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	4	127	479	578	677	579	422	116	3	0	2765
1958-59	0	0	16	120	343	549	523	434	335	86	3	0	2409
1959-60	0	0	0	35	439	573	691	534	176	38	10	0	2514
1960-61	0	0	0	66	397	806	733	473	268	97	1	0	2821
1961-62	0	0	0	82	513	575	734	518	422	86	3	0	2715
1962-63	0	0	0	69	353	608	733	438	278	41	0	0	2517
1963-64	0	0	0	17	341	683	788	693	354	99	3	0	2981
1964-65	0	0	0	76	391	643	521	504	397	54	7	2	2595
1965-66	0	0	4	107	249	592	788	612	284	59	4	0	2691
1966-67	0	0	2	126	367	693	718	469	173	36	23	0	2571
1967-68	0	0	2	106	392	720	691	418	277	128	8	0	2791
1968-69	0	0	0	61	414	728	503	464	477	43	24	0	2716
1969-70	0	0	0	62	371	584	536	548	284	94	33	0	2256
1970-71	0	0	39	180	388	519	625	457	254	110	6	0	2578
1971-72	0	0	31	112	381	624	607	364	128	36	3	0	2386
1972-73	0	0	3	87	480	563	679	499	364	218	51	0	2944
1973-74	0	0	7	90	326	592	636	538	178	79	5	0	2481
1974-75	0	0	42	187	445	728	672	643	309	188	13	0	2948
1975-76	0	0	28	66	399	648	696	551	278	91	28	0	2367
1976-77	0	0	7	214	601	709	625	493	469	138	3	0	3256
1977-78	0	0	0	34	328	472							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	0	0	1	71	290	581	627	647	572	153	2	0	2626
1970	0	0	2	37	263	448	559	514	321	19	0	0	2183
1971	0	0	45	45	235	492	543	373	295	43	0	0	2071
1972	0	4	15	70	159	404	543	401	247	120	0	0	1963
1973	0	0	0	7	152	353	439	448	340	44	7	0	1812
1974	0	0	15	84	338	548	459	378	181	34	0	0	2033
1975	0	0	9	39	178	482	469	502	241	41	1	0	1950
1976	0	0	4	71	178	441	418	434	179	18	0	0	1735
1977	0	0	0	39	186	500	548	552	369	63	0	0	2240

GALVESTON, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	49	145	175	401	370	220	13	0	0	1382
1958-59	0	0	0	35	102	334	418	263	134	45	0	0	1329
1959-60	0	0	0	10	253	298	384	480	284	11	3	0	1573
1960-61	0	0	0	15	74	366	484	233	91	35	1	0	1291
1961-62	0	0	0	9	148	332	461	97	104	24	0	0	1139
1962-63	0	0	0	0	99	311	494	364	75	9	0	0	1354
1963-64	0	0	0	0	80	480	393	384	174	11	0	0	1502
1964-65	0	0	0	3	102	293	254	278	249	2	0	0	1181
1965-66	0	0	0	5	12	152	447	320	138	9	0	0	1083
1966-67	0	0	0	14	63	298	356	287	61	0	0	0	1081
1967-68	0	0	0	3	18	78	243	381	404	233	0	0	1362
1968-69	0	0	0	0	4	162	283	296	236	281	0	0	1262
1969-70	0	0	0	0	9	127	189	490	244	193	29	9	1272
1970-71	0	0	0	31	141	139	230	233	193	30	0	0	968
1971-72	0	0	0	0	91	131	210	211	33	2	0	0	699
1972-73	0	0	0	0	23	289	424	329	99	73	0	0	1402
1973-74	0	0	0	0	1	23	249	251	161	61	10	0	776
1974-75	0	0	0	0	2	121	234	208	201	120	28	0	934
1975-76	0	0	0	4	120	309	353	128	82	0	0	0	1004
1976-77	0	0	0	94	313	373	563	374	102	3	0	0	1724
1977-78	0	0	0	6	63	238							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	3	4	4	149	353	500	602	609	492	289	81	11	3074
1970	0	0	3	174	292	486	597	583	494	181	36	39	2889
1971	3	9	19	130	316	500	576	569	448	360	103	49	3037
1972	30	28	91	234	360	510	560	597	508	296	48	8	3272
1973	1	0	41	93	296	454	576	523	476	356	192	19	3039
1974	16	14	94	178	383	481	561	553	395	253	68	7	2939
1975	19	11	52	132	379	483	588	589	378	224	106	11	3013
1976	0	4	48	136	339	437	516	550	443	113	7	0	2549
1977	0	4	21	160	350	488	552	555	490	254	79	21	2980

HOUSTON, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	71	183	293	449	417	234	30	0	0	1631
1958-59	0	0	0	48	145	373	452	234	163	58	0	0	1493
1959-60	0	0	0	7	309	306	416	441	260	8	1	0	1748
1960-61	0	0	0	17	184	396	473	227	96	61	0	0	1328
1961-62	0	0	0	14	184	287	480	99	209	32	0	0	1307
1962-63	0	0	0	8	157	313	315	381	98	7	0	0	1439
1963-64	0	0	0	0	108	591	413	446	158	19	0	0	1693
1964-65	0	0	0	31	114	319	300	284	250	0	0	0	1294
1965-66	0	0	2	20	23	212	516	334	144	12	0	0	1263
1966-67	0	0	0	27	99	350	342	298	68	0	0	0	1193
1967-68	0	0	0	18	99	312	390	415	239	17	0	0	1489
1968-69	0	0	0	9	199	297	284	234	281	1	0	2	1503
1969-70	0	0	0	29	236	384	579	309	292	91	12	0	1774
1970-71	0	0	8	72	274	209	298	273	214	72	3	0	1420
1971-72	0	0	2	6	193	194	315	295	93	17	0	0	1109
1972-73	0	0	2	50	320	410	540	379	75	117	3	0	1898
1973-74	0	0	0	8	74	364	330	273	95	60	0	0	1204
1974-75	0	0	0	19	196	336	290	270	179	48	0	0	1334
1975-76	0	0	0	26	217	399	441	178	139	26	7	0	1449
1976-77	0	0	0	175	398	484	687	512	164	25	0	0	2249
1977-78	0	0	0	34	190	365							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	35	13	11	167	328	496	606	569	402	222	48	9	2868
1970	18	3	7	188	238	489	513	567	423	151	98	76	2611
1971	48	18	33	126	292	484	594	483	489	229	52	44	2819
1972	58	28	71	209	275	488	580	482	447	268	17	12	2736
1973	1	4	41	111	253	434	544	498	401	229	151	12	2699
1974	24	33	138	132	376	454	526	519	293	196	60	18	2821
1975	47	8	61	159	342	459	514	505	393	174	68	24	2854
1976	3	43	75	119	182	408	498	320	301	63	9	0	2223
1977	0	5	44	91	302	487	567	565	494	173	98	23	2751

LUBBOCK, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	19	228	601	960	868	677	736	293	33	0	4147
1958-59	0	0	24	197	646	779	835	622	698	266	38	1	3678
1959-60	0	0	31	225	609	693	846	833	809	142	57	0	4029
1960-61	0	0	8	135	621	872	986	653	644	218	38	2	3684
1961-62	0	0	24	154	662	790	942	657	585	176	13	3	3692
1962-63	0	0	18	143	628	692	988	627	578	92	36	0	3402
1963-64	0	0	11	27	625	872	888	821	693	139	13	4	3603
1964-65	0	0	38	111	635	677	835	683	682	187	12	0	3379
1965-66	0	0	22	96	235	821	946	677	587	166	48	0	3666
1966-67	0	0	3	179	283	827	748	682	288	85	84	3	3152
1967-68	0	4	17	190	463	866	748	762	507	293	73	4	3927
1968-69	0	1	31	151	543	770	614	601	723	128	45	7	3612
1969-70	0	0	3	312	486	673	846	539	577	198	47	21	3702
1970-71	0	0	98	286	484	608	723	615	438	186	30	0	3623
1971-72	0	0	83	124	621	836	728	548	275	94	48	0	2970
1972-73	2	0	23	220	672	831	978	668	416	312	98	0	4130
1973-74	0	0	31	99	348	703	726	536	223	127	11	0	2796
1974-75	0	0	109	144	588	753	744	664	474	233	18	4	3661
1975-76	0	0	76	122	436	680	780	597	392	116	97	0	3036
1976-77	0	0	38	335	665	760	939	520	397	153	1	0	3798
1977-78	0	0	0	80	373	611							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	0	0	0	36	160	370	373	461	105	36	0	0	1623
1970	0	0	0	11	167	348	498	440	244	32	2	0	1747
1971	0	0	14	39	197	408	476	269	232	34	4	0	1649
1972	0	0	14	120	119	362	366	297	211	63	0	0	1552
1973	0	0	0	19	153	384	387	401	197	71	2	0	1594
1974	0	0	30	78	330	613	491	300	86	18	0	0	1746
1975	0	0	0	49	187	383	392	195	49	0	0	0	1447
1976	0	1	0	49	93	389	317	409	187	4	8	0	1422
1977	0	0	0	19	221	435	482	485	376	36	0	0	2027

MIDLAND/ODESSA, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	2	133	330	504	709	544	522	178	16	0	3180
1958-59	0	0	10	101	358	644	686	501	391	179	6	0	2886
1959-60	0	0	9	110	534	554	666	643	484	84	28	0	3054
1960-61	0	0	2	64	307	738	761	674	498	124	9	4	2792
1961-62	0	0	12	66	481	625	796	509	394	96	7	0	2786
1962-63	0	0	2	74	299	595	772	487	253	45	19	0	2527
1963-64	0	0	1	9	276	761	656	643	287	63	3	0	2693
1964-65	0	0	0	34	283	693	555	604	528	52	5	0	2961
1965-66	0	0	11	96	232	668	831	621	458	124	46	0	2687
1966-67	0	3	4	139	242	663	654	516	176	23	22	0	2442
1967-68	0	0	9	93	324	708	654	582	390	143	14	0	2869
1968-69	0	0	8	66	484	665	533	467	534	82	30	0	2799
1969-70	0	0	0	214	405	532	706	482	483	137	48	9	2994
1970-71	0	0	41	130	348	441	540	493	297	119	13	0	2444
1971-72	0	0	31	71	390	528	639	446	176	37	12	0	2310
1972-73	0	0	19	158	551	690	804	587	380	249	55	0	3403
1973-74	0	0	15	81	252	961	607	429	121	68	1	0	2135
1974-75	0	0	44	63	344	594	582	468	314	139	2	3	2951
1975-76	0	0	40	82	340	580	652	258	261	73	38	0	2304
1976-77	0	0	10	220	545	635	755	409	320	117	0	0	3011
1977-78	0	0	0	47	295	478							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	0	0	0	66	170	402	597	539	284	97	3	0	2182
1970	0	0	0	37	265	389	562	467	301	59	0	1	2001
1971	0	0	19	39	265	418	491	301	234	47	3	0	1831
1972	0	0	31	187	183	423	446	338	249	88	0	0	1945
1973	0	0	0	18	178	388	414	427	229	88	5	0	1737
1974	0	0	38	109	394	488	575	455	136	30	5	0	2270
1975	0	0	10	80	220	406	404	439	217	86	5	0	1927
1976	0	10	21	68	155	398	344	434	219	22	0	0	1671
1977	0	0	9	21	359	522	584	638	518	112	1	0	2764

PORT ARTHUR, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	83	161	269	478	460	232	34	0	0	1717
1958-59	0	0	0	46	170	422	469	289	163	59	0	0	1638
1959-60	0	0	0	28	313	340	494	461	304	15	6	0	1913
1960-61	0	0	0	23	122	443	542	260	81	99	0	0	1552
1961-62	0	0	0	33	198	306	543	110	270	42	0	0	1502
1962-63	0	0	0	20	193	387	575	384	102	12	0	0	1673
1963-64	0	0	0	4	141	378	467	452	172	22	0	0	1817
1964-65	0	0	0	52	135	337	322	298	270	3	0	0	1417
1965-66	0	0	0	43	34	230	329	324	180	19	0	0	1381
1966-67	0	0	0	46	115	383	417	325	111	0	2	0	1399
1967-68	0	0	10	33	133	313	435	485	244	18	0	0	1671
1968-69	0	0	0	20	267	343	331	289	317	4	0	0	1511
1969-70	0	0	0	22	212	281	545	393	180	22	3	0	1658
1970-71	0	0	0	28	213	198	289	254	167	43	0	0	1142
1971-72	0	0	0	6	268	199	317	291	109	20	0	0	1150
1972-73	0	0	0	57	340	390	532	389	77	118	2	0	1905
1973-74	0	0	0	13	83	384	288	288	89	36	0	0	1177
1974-75	0	0	0	20	230	384	297	276	180	67	0	0	1454
1975-76	0	0	0	16	209	413	464	170	128	16	0	0	1416
1976-77	0	0	0	149	375	430	626	269	110	16	0	0	1983
1977-78	0	0	0	18	112	321							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	17	4	3	139	316	484	621	569	438	247	60	6	2878
1970	13	2	23	229	309	484	617	644	518	194	49	85	3163
1971	42	24	42	167	323	517	527	491	388	223	42	43	2791
1972	21	18	32	164	262	461	498	479	468	208	17	9	2581
1973	0	2	38	84	244	440	524	459	428	242	137	4	2602
1974	27	15	138	159	362	423	524	509	305	143	99	29	2665
1975	28	0	61	130	344	454	516	508	335	186	71	18	2660
1976	2	29	66	137	226	418	513	512	404	61	0	0	2371
1977	0	4	62	129	361	502	627	621	591	235	82	28	3288

SAN ANGELO, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	0	138	451	624	611	566	487	142	14	0	2813
1958-59	0	0	2	143	297	616	614	458	294	158	6	0	2558
1959-60	0	0	4	87	499	512	576	580	406	69	31	0	2764
1960-61	0	0	0	39	232	662	701	611	215	83	1	1	2947
1961-62	0	0	0	66	437	578	719	265	371	53	6	0	2490
1962-63	0	0	0	36	239	526	711	451	193	34	7	0	2165
1963-64	0	0	0	4	269	747	609	582	169	30	3	2	2400
1964-65	0	0	2	69	277	492	489	514	471	31	0	0	2521
1965-66	0	0	0	76	144	416	767	538	291	53	30	0	2227
1966-67	0	0	0	127	192	614	568	459	113	2	19	0	2094
1967-68	0	0	0	76	269	608	577	550	304	127	1	0	2497
1968-69	0	0	0	38	362	592	599	572	416	33	9	0	2171
1969-70	0	0	0	122	395	491	654	591	374	92	44	0	2453
1970-71	0	0	26	126	320	526	453	359	211	81	9	0	1911
1971-72	0	0	23	33	289	450	539	382	138	26	3	0	1883
1972-73	0	0	3	97	458	577	738	514	183	191	20	0	2781
1973-74	0	0	1	33	170	476	354	352	113	33	1	0	1755
1974-75	0	0	33	37	308	560	568	470	288	101	1	0	2366
1975-76	0	0	32	73	320	519	643	251	237	48	30	0	2157
1976-77	0	0	3	220	518	595	757	377	227	63	0	0	2762
1977-78	0	0	0	44	269	390							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	0	1	6	99	213	513	707	620	311	113	23	0	2612
1970	0	1	7	139	248	422	575	639	432	101	10	9	2585
1971	0	4	49	139	232	482	557	529	309	96	23	0	2318
1972	0	20	45	237	191	498	576	468	404	140	7	2	2593
1973	0	0	6	67	274	428	573	594	314	104	49	0	2366
1974	3	4	120	147	349	481	597	600	159	87	13	0	2422
1975	3	0	18	103	220	448	627	493	238	90	18	0	2058
1976	0	12	29	64	193	469	394	491	272	27	0	0	1855
1977	0	6	14	53	393	523	621	662	502	183	17	1	2975

SAN ANTONIO, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1947-48	0	0	0	71	270	292	493	419	269	22	0	0	1816
1948-49	0	0	0	79	171	451	497	311	179	96	0	0	1776
1949-50	0	0	0	27	376	336	467	433	291	14	7	0	1949
1950-51	0	0	0	17	138	457	523	373	82	63	0	0	1532
1951-52	0	0	0	19	223	351	586	108	206	27	0	0	1520
1952-53	0	0	0	9	164	393	579	349	87	17	3	0	1597
1953-54	0	0	0	0	141	392	428	434	143	23	0	0	1761
1954-55	0	0	0	41	159	414	346	419	227	13	0	0	1719
1955-56	0	0	2	63	66	301	607	429	182	30	9	0	1688
1956-57	0	0	0	37	131	436	478	368	88	0	0	0	1540
1957-58	0	0	0	48	144	429	477	478	254	39	0	0	1697
1958-59	0	0	0	9	278	437	394	319	315	9	3	0	1780
1959-60	0	0	0	52	293	299	599	282	264	45	7	0	1803
1960-61	0	0	1	72	247	201	282	239	134	52	1	0	1229
1961-62	0	0	1	0	129	286	382	263	61	7	0	0	1109
1962-63	0	0	0	29	334	457	551	362	29	94	1	0	1857
1963-64	0	0	0	4	85	391	437	287	74	39	0	0	1287
1964-65	0	0	2	19	260	439	388	319	152	41	0	0	1618
1965-66	0	0	1	21	214	394	472	168	143	11	2	0	1426
1966-67	0	0	0	160	382	481	643	336	144	32	0	0	2158
1967-68	0	0	0	19	138	360							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	11	5	8	133	273	494	682	652	458	207	53	2	2969
1970	3	3	20	208	259	478	592	651	493	163	40	37	2967
1971	14	36	130	189	414	564	658	589	499	281	81	31	3368
1972	11	31	105	276	252	465	542	539	515	249	12	6	3003
1973	8	0	69	129	310	431	570	536	437	242	114	0	2844
1974	11	22	171	188	387	439	568	504	284	124	34	3	2684
1975	29	1	91	151	273	457	502	526	337	217	80	30	2652
1976	3	62	112	134	202	491	467	521	382	45	0	0	2363
1977	0	3	92	98	311	502	620	618	525	218	38	3	2690

VICTORIA, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1947-48	0	0	0	63	199	224	392	338	223	9	0	0	1448
1948-49	0	0	0	31	122	385	420	283	139	66	0	0	1452
1949-50	0	0	0	14	295	293	377	378	244	7	3	0	1571
1950-51	0	0	0	17	106	395	486	233	67	27	0	0	1341
1951-52	0	0	0	15	148	287	501	90	178	20	0	0	1259
1952-53	0	0	0	7	131	313	538	318	68	3	0	0	1378
1953-54	0	0	0	0	93	499	332	376	113	16	0	0	1421
1954-55	0	0	0	22	102	321	275	294	255	0	0	0	1269
1955-56	0	0	2	28	28	202	499	341	122	14	3	0	1239
1956-57	0	0	0	17	83	327	350	267	30	0	0	0	1094
1957-58	0	0	0	15	83	332	414	409	208	16	0	0	1481
1958-59	0	0	0	0	188	287	281	298	261	1	0	0	1232
1959-60	0	0	0	14	174	202	498	230	202	24	5	0	1359
1960-61	0	0	0	44	189	149	228	222	120	49	0	0	997
1961-62	0	0	2	0	96	152	270	229	90	2	0	0	801
1962-63	0	0	0	14	264	376	476	301	20	44	0	0	1515
1963-64	0	0	0	0	26	234	310	183	70	17	0	0	860
1964-65	0	0	0	7	193	286	244	204	92	14	0	0	1004
1965-66	0	0	0	6	163	316	364	120	98	2	0	0	1069
1966-67	0	0	0	111	325	398	585	248	82	8	0	0	1753
1967-68	0	0	0	8	86	261							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	38	16	15	184	313	512	687	659	472	263	89	14	3236
1970	19	6	23	234	269	458	561	617	492	184	93	84	2962
1971	70	33	104	172	380	540	630	548	492	303	78	58	3370
1972	58	28	134	299	350	510	562	582	541	285	37	13	3408
1973	3	10	109	138	358	477	638	586	474	313	201	15	3294
1974	20	38	207	229	458	494	613	594	344	271	93	17	3358
1975	41	19	118	223	421	535	597	581	401	240	114	29	3351
1976	7	54	107	186	263	478	583	550	414	88	16	1	2669
1977	4	8	74	144	376	517	598	615	591	234	89	37	3283

WACO, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1947-48	0	0	0	113	360	327	559	514	401	80	7	0	2361
1948-49	0	0	0	71	208	577	604	411	231	132	0	0	2234
1949-50	0	0	0	33	448	396	501	562	402	29	13	0	2464
1950-51	0	0	0	36	206	586	668	533	139	101	0	0	2088
1951-52	0	0	0	37	326	480	674	235	282	67	1	0	2110
1952-53	0	0	0	26	218	484	741	492	136	31	5	0	2093
1953-54	0	0	0	2	208	726	562	559	235	42	2	0	2336
1954-55	0	0	0	45	196	458	427	469	424	19	0	0	2039
1965-66	0	0	2	72	100	393	706	522	291	75	13	0	2174
1966-67	0	0	0	52	126	557	511	490	114	4	14	0	1868
1967-68	0	0	0	46	198	480	560	519	288	79	0	0	2176
1968-69	0	0	0	22	294	484	438	382	405	15	1	0	2041
1969-70	0	0	0	79	278	444	719	414	372	60	11	0	2373
1970-71	0	0	4	87	286	288	411	549	188	50	5	0	1668
1971-72	0	0	4	5	230	360	543	368	109	19	3	0	1642
1972-73	0	0	4	89	426	638	696	492	149	170	13	0	2677
1973-74	0	0	0	22	118	460	605	322	145	52	0	0	1724
1974-75	0	0	13	14	274	578	507	495	393	120	0	0	2344
1975-76	0	0	2	27	230	462	556	200	204	36	8	0	1727
1976-77	0	0	0	205	446	596	*827	569	179	21	2	0	2617
1977-78	0	0	0	22	173	419							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	12	2	1	111	329	537	796	723	470	208	40	0	3217
1970	4	0	0	139	260	483	639	723	447	136	28	29	2892
1971	6	14	46	162	325	576	653	689	434	206	40	7	2962
1972	3	24	72	205	266	539	581	608	499	178	6	0	2939
1973	0	0	12	60	225	375	587	611	429	182	72	0	2553
1974	0	0	138	128	382	481	683	610	225	169	31	2	2834
1975	2	0	36	100	227	448	533	618	576	206	83	19	2638
1976	0	33	72	81	193	489	542	644	395	73	5	0	2507
1977	0	7	20	94	366	593	796	719	628	224	34	13	3452

WICHITA FALLS, TEXAS

Heating Degree Days

Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1957-58	0	0	4	190	491	539	688	677	630	183	18	0	3620
1958-59	0	0	4	120	308	724	818	540	329	166	4	0	3013
1959-60	0	0	9	139	551	537	744	732	604	84	92	0	3494
1960-61	0	0	1	41	294	786	798	825	300	167	16	0	3440
1961-62	0	0	4	62	499	723	875	608	427	139	3	0	3140
1962-63	0	0	2	68	313	577	914	565	281	56	22	0	2800
1963-64	0	0	1	8	278	823	655	634	304	82	6	0	2855
1964-65	0	0	12	86	352	706	679	563	647	47	2	0	3094
1965-66	0	0	13	120	241	494	929	633	275	139	33	0	2877
1966-67	0	2	0	119	247	723	593	538	167	30	41	0	2460
1967-68	0	0	14	93	366	674	699	687	357	139	23	0	3048
1968-69	0	0	0	68	431	676	646	563	608	91	14	4	3082
1969-70	0	0	1	239	411	634	891	528	534	131	19	4	3588
1970-71	0	0	20	205	474	929	749	560	395	131	15	0	3078
1971-72	0	0	37	29	364	578	787	574	273	77	12	0	2727
1972-73	0	0	8	193	571	771	839	577	218	234	47	0	3653
1973-74	0	0	10	42	248	621	752	416	212	88	1	0	2392
1974-75	0	0	36	54	398	673	644	628	630	157	0	0	3020
1975-76	0	0	52	87	338	606	690	295	318	73	40	0	2499
1976-77	0	0	7	265	352	731	1023	439	261	80	1	0	3209
1977-78	0	0	0	64	345	645							

Cooling Degree Days

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1969	0	0	0	57	206	438	742	591	320	79	3	0	2436
1970	0	0	4	85	253	452	622	627	365	76	3	0	2487
1971	0	0	14	78	226	573	672	670	357	124	11	0	2925
1972	0	4	28	149	174	517	672	563	377	167	2	0	2507
1973	0	0	3	21	159	351	559	570	298	132	33	0	2124
1974	0	0	65	80	356	434	676	512	135	73	6	0	2377
1975	0	0	10	81	210	436	529	556	237	116	15	0	2190
1976	0	21	39	54	124	395	500	601	282	44	0	0	2060
1977	0	2	2	34	284	537	652	670	502	88	3	0	2644

ENERGY AUDIT FORM EA-2

4.0 CLIMATE FACTORS

City	4.1 Annual Avg.Heating Deg. Days	4.2 Annual Avg.Cooling Deg. Days	4.3(B) Average Monthly Wind Velocity (MPH)											
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Abilene	2,610	2,466	12.1	12.9	14.3	14.1	13.2	13.1	10.9	10.4	10.5	11.1	11.7	12.1
Amarillo	4,183	1,433	13.1	14.2	15.6	15.5	14.8	14.4	12.5	12.1	13.0	13.0	13.2	13.0
Austin	1,737	2,908	9.8	10.2	11.0	10.7	9.8	9.5	8.5	8.1	8.0	8.1	9.2	9.2
Brownsville	650	3,874	11.7	12.4	13.7	14.3	13.4	12.5	11.6	10.5	9.6	9.7	10.8	10.9
Corpus Christi	930	3,474	12.0	12.9	14.0	14.4	12.9	12.0	11.6	10.8	10.2	10.1	11.3	11.2
Dallas/Ft.Worth	2,382	2,587	11.3	12.1	13.2	12.8	11.2	10.9	9.5	9.1	9.5	9.7	10.8	11.1
Del Rio	1,523	3,363	8.7	9.6	10.9	11.0	10.6	11.5	11.0	10.2	9.4	9.1	8.5	8.5
El Paso	2,678	2,098	9.0	9.9	11.8	11.8	11.0	10.0	8.9	8.4	8.3	8.1	8.5	8.5
Galveston	1,224	3,004	11.6	11.8	11.9	12.1	11.5	10.7	9.8	9.4	10.1	10.3	11.2	11.3
Houston	1,434	2,889	8.1	8.7	9.5	9.2	7.9	7.4	6.4	5.3	6.5	6.4	7.7	7.7
Lubbock	3,545	1,647	12.4	13.8	15.3	15.4	14.5	14.0	11.4	10.1	10.7	11.3	11.8	12.2
Midland/Odessa	2,621	2,250	10.1	11.2	12.5	12.7	12.3	12.1	10.5	9.8	10.0	9.9	10.0	10.0
Port Arthur	1,518	2,798	11.2	11.8	12.2	12.3	10.5	9.1	7.9	7.5	8.6	9.0	10.5	10.8
San Angelo	2,240	2,702	10.3	10.9	12.4	12.2	11.4	11.3	9.7	9.1	9.0	9.2	9.9	9.9
San Antonio	1,570	2,994	9.1	9.8	10.5	10.6	10.1	10.1	9.1	8.5	8.5	8.4	8.9	8.6
Victoria	1,227	3,140	10.6	11.1	11.8	12.1	10.8	9.8	8.9	8.4	8.6	8.8	9.8	10.2
Waco	2,058	2,863	12.0	12.4	13.4	13.3	12.1	11.9	10.9	10.0	9.6	10.0	11.0	11.3
Wichita Falls	2,904	2,611	11.3	11.9	13.4	13.3	12.0	12.1	10.9	10.3	10.4	10.5	11.5	11.2

PAYBACK CALCULATION

The Simple Payback calculation and ranking is an accurate way to compare energy conservations options but is only intended for comparison. Actual dollar savings to implement a conservation option must include energy price escalation on a life-cycle basis.

Life-cycle savings is the dollar savings accrued by an energy saving option over its life.

Suppose an energy saving option with a 7-year life-cycle saved $100 a year in energy costs at current prices. If energy did not increase in cost, then the energy option would have saved $700 over its 7-year life. However, prices of energy are escalation at approximately 20% per year. As a result, an option which saves $100 this year will save much more in the following years. The following chart is used to find the appropriate escalation factor at selected escalation rates.

ENERGY PRICE ESCALATION*

Energy Cost Escalation Rate	ESCALATION FACTOR			
	5.00 yrs.	7.00 yrs.	10.00 yrs.	15.00 yrs.
10%	6.72	10.44	17.53	34.95
15%	7.75	12.73	23.34	54.72
20%	8.93	15.50	31.15	86.44

* Adapted from Fritz Dressler, Practical Energy Management in Health Care Institutions, 199, p. 7

For example, the escalation factor for an option with a 7 year life expectancy and at a 20% escalation rate would be 15.50. To determine the life-cycle savings, multiply the escalation factor times the first year savings. If an item saves $100 the first year and has a 7 year life expectancy, then:

$100 x 15.50 = $1,550 saved over the life of the item.